NUCLEAR SCIENCE ABSTRACTS

Volume 9 August 15, 1955 No. 15

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NUCLEAR SCIENCE ABSTRACTS

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GENERAL

ATOMIC POWER

4908 DL-18

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

ATOMIC ENERGY A SOURCE OF FUTURE POWER—ITS IMPACT ON INDUSTRY. W. B. Lewis. May 1955. 11p. (AECL-180)

A nontechnical talk on atomic power is presented. Relative costs, advantages and disadvantages, and the need for experienced engineers are discussed. (M.P.G.)

4909

A GROWTH SURVEY OF THE ATOMIC INDUSTRY [FOR] 1955-65. New York, Atomic Industrial Forum, Inc., Apr. 1955. 64p. $7.50.

The results of an economic survey of the projected total atomic energy program in the United States for the next ten years are reported. The survey is divided into two sections: survey of private nuclear research and development and projection of requirements for reactor development and construction. (C.W.H.)

RESEARCH PROGRAMS

4910 CERN-55-1

European Organization for Nuclear Research, Geneva.

REPORTS TO MEMBER STATES, CERN, 1952–1954. [Edoardo Amaldi]. Jan. 4, 1955. 117p.

Three reports are presented which were written in 1952–4 at different stages in the evolution of CERN, the European Council for Nuclear Research. The first report presents the historical background and organization of CERN, a description of the proposed international laboratory equipped with a 10-Bev proton synchrotron and a 600-Mev synchrocyclotron, and a summary of the technical cooperation program. The second report supersedes the first one and is intended to present in condensed form all the essential information needed by the countries concerned. The envisaged proton synchrotron and synchrocyclotron are described. The proton synchroton is expected to be capable of accelerating protons up to 30 Bev by making use of the alternating-gradient strong-focusing principle. Structure and finances of the laboratory are summarized. Research on proton synchrotron orbits, r-f system, magnet design, and shielding is reported. The layout of the laboratory and accelerator buildings is presented. The third report summarizes the organization and financial situation and presents brief progress reports on the proton synchrotron, synchrocyclotron, laboratory, and theoretical study group. (M.P.G.)

BIOLOGY AND MEDICINE

4911 ANL-5426

Argonne National Lab., Lemont, Ill.

QUARTERLY REPORT OF BIOLOGICAL AND MEDICAL RESEARCH DIVISION. Apr. 1955. 174p. Contract W-31-109-Eng-38.

Progress is reported on the following studies: a γ-ray method for the measurement of Ra partition; geographic differences in bone tumor death rates; radium metabolism in dogs; the comparative effectiveness of several x-ray qualities for acute lethality in mice and rabbits; biochemical changes in rats and bats exposed to massive doses of x radiation; tissue distribution of ascorbic acid following whole-body x irradiation of rats; the effect of cold treatment on the recovery of x-irradiated Ascaris eggs; DNA synthesis during radioinduced division block in Tetrahymena; the toxicity of radiostrontium in dogs; the design of animal exposure chambers for the CP-5; photoperiodic response of Xanthium; the mechanism of the indole-3-acetic acid oxidase system; the effects of strong acids on lysozyme; the activation of methionine for transmethylation; tracer studies on the metabolism of nucleic acid purines in the rat; the biosynthesis of methionine by bacteria; the preparation of samples for electron microscopy; structural changes in mitochondria; size measurements on bacteria; protein synthesis in the pancreas; centrifugation of giant amoebae; the effect of nonirradiated, centrifuged protoplasm on supralethally x-irradiated giant amoeba cells; the effect of whole-body x irradiation on fertility in the mouse; the effects of neutron irradiation on phosphates; liquid scintillation counting of low-energy β emitters; the effects of thorazine and of phenergan on survival of rats and mice after lethal doses of whole-body x radiation; the pharmacology of aurintricarboxylic acid; a method of fitting the multi-hit survival curve; ionization in heavy gases; effects of photoperiodism on Paramecium; the quantitative separation of fructose, glucose, and sucrose on a cellulose column; the use of Cr^{51} and P^{32} for labelling chicken erythrocytes; and the effectiveness of various compounds for the control of mouse mange. (For preceding period see ANL-5378.) (C.H.)

4912 UCRL-2995

California. Univ., Berkeley. Radiation Lab.

CIGARETTE SMOKING, SERUM LIPOPROTEINS, AND CORONARY HEART DISEASE. John W. Gofman, Frank T. Lindgren, Beverly Strisower, Oliver deLalla, Frank Glazier, and Arthur Tamplin. May 13, 1955. 6p. Contract W-7405-eng-48.

RADIATION EFFECTS

4913 USNRDL-TR-45

Naval Radiological Defense Lab., San Francisco.

ACUTE DESTRUCTION OF ERYTHROCYTES IN EXPERIMENTAL RADIANT ENERGY BURNS. D. M. Jones, E. L. Alpen, and A. K. Davis. Apr. 19, 1955. 22p. (AFSWP-736)

The acute post-burn erythrocyte deficit in the rat was measured with Fe^{59}-labeled red cells. The burns were moderate to severe flash burns, from 8 cal/sq cm (minimal third degree) to 16 cal/sq cm (severe third degree). Destruction of red cells ranged from 8% at 8 cal/sq cm to 25% at 16 cal/sq cm. These burns are equivalent to those which might occur in skin exposed to a nuclear detonation. Longer exposure to radiation did not affect red cell destruction, nor did increasing the burn area from 15 to 22%. Red cell destruction was greater than that from contact thermal burns. Also, a small deficit in red cell volume, in addition to that from direct heat, can be expected from a continuing hemolytic process. (auth)

4914

EFFECT OF IRRADIATION ON HEMIN FORMATION. R. Bonnichsen and G. Hevesy (Univ. of Stockholm, Sweden). Acta Chem. Scand. 9, No. 3, 509-18(1955).

Irradiation with x rays was found to depress very appreciably the rate of extrusion of Fe^{59} bound to β_1-globulin in the circulation of the rabbit, the depression being much more pronounced 2 days after irradiation than shortly after exposure. It is suggested that erythrocytes of the bone marrow which have not yet completed their hemoglobin content are radioresistant and continue to incorporate Fe^{59} in the bone marrow of the irradiated animal. Correspondingly, the effect of exposure to radiation on the rate of extrusion of Fe^{59} from the plasma gets strongly pronounced only after the lapse of several hours. A radiation dose which reduces the incorporation of Fe^{59} into the hemoglobin to 30% of that of controls does not diminish the rate of incorporation of Fe^{59} into cytochrom b of the liver of guinea-pigs. The rate of incorporation of Fe^{59} into myoglobin of the muscles of quinea-pigs was found to be reduced in the exposed animals. The interpretation of this finding are discussed. (auth)

4915

EFFECTS OF X-RAYS AND WATER CONTENT ON SUGARS IN BARLEY SEEDS. L. Ehrenberg and M. Jaarma (Univ. of Stockholm, Sweden). Acta Chem. Scand. 9, No. 3, 539-40 (1955).

4916

THE RELATION OF NEUTRON DOSE TO CHROMOSOME CHANGES AND POINT MUTATIONS IN DROSOPHILA. I. TRANSLOCATIONS. H. J. Muller (Indiana Univ., Bloomington). Am. Naturalist 88, 437-59(1954) Nov.-Dec.

4917

STUDIES IN THE MODE OF ACTION OF IONIZING RADIATIONS. INFLUENCE OF CELL CONCENTRATION ON LETHAL EFFECTS OF X-RAYS ON ESCHERICHIA COLI. Carissimo Biagini (Institute of Radiology, Univ. of Florence, Italy and Institute of General Pathology, Univ. of Perugia, Italy). Arch. Biochem. Biophys. 56, 38-44(1955) May.

4918

EFFECT OF X-RAYS ON THE QUANTITY AND METABOLISM OF DESOXYRIBONUCLEIC ACID IN THE LIVER OF RATS EXAMINED WITH P^{32}. Aleksandar D. Bećarević, Katica I. Kaćanski, and Desanka D. Mančić. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 123-6(1955) Mar.

The effects of x rays on the metabolism of desoxyribonucleic acid in the liver of rats was examined with P^{32}. The rats were irradiated with 950 r. It was found that 24 hrs after irradiation the incorporation of P^{32} decreases for about 72%. (auth)

4919

VITAMINS AND ENZYMES IN MILK. EFFECT OF GAMMA-RADIATION ON ACTIVITY. Hung-Chun Kung, Elmer L. Gaden, Jr., and C. G. King (Columbia Univ., New York). J. Agr. and Food Chem. 1, 142-4(1953) Apr. 15.

Interest in the use of radiations from fission products includes consideration of sterilizing biological products to accomplish stabilization. Tests were undertaken to measure vitamin and enzyme retention in milk and related products coincident with irradiation from cobalt-60. Vitamin A, tocopherols, and ascorbic acid were highly sensitive to destruction within the time period required for sterilization (at relatively low intensities). Carotenoids and riboflavin were moderately sensitive. The enzyme phosphatase, however, which is very sensitive to heat inactivation, was slightly changed during identical exposures. Tests with raw whole milk, pasteurized whole milk, evaporated milk, cream, margarine, Cheddar cheese, and cream cheese demonstrate that irradiation at 80,000 roentgens per hour induces severe losses in nutritive quality before sterilization is accomplished. Changes in enzyme activity, however, are sharply reversed in comparison with best effects on natural products. Protein denaturization apparently can be avoided, relatively, while accomplishing this type of sterilization. (auth)

4920

THE DYNAMICS OF PLATELET PRODUCTION AS STUDIED BY A DEPLETION TECHNIQUE IN NORMAL AND IRRADIATED DOGS. Charles G. Craddock, Jr., William S. Adams Seymour Perry, and John S. Lawrence (Univ. of California Medical Center and Sawtelle Veterans Administration Hospital, Los Angeles). J. Lab. Clin. Med. 45, 906-19(1955) June.

Thrombopoiesis in normal and irradiated dogs has been studied by removal of platelets from the peripheral blood at a rate exceeding their entry from the marrow. Findings are summarized. (C.H.)

4921

RADIOLOGICAL HAZARDS FROM NUCLEAR EXPLOSIONS AND NUCLEAR POWER. John Cockcroft. Nature 175, 873-5(1955) May 21.

The level of radioactive contamination in the world produced by all the nuclear bomb explosions and peaceful atomic energy activities is at present so low that it should not cause any anxiety. The radiation level which would give rise to serious harmful effects is probably at least a thousand times the present level of contamination. We do not at present know this figure with any accuracy, and long-term genetic studies are required to determine this. (auth)

4922

RADIATION SENSITIVITY AND THE MITOTIC CYCLE IN VICIA FABA. John McLeish (John Innes Horticultural Institution, Bayfordbury, England). Nature 175, 890-1(1955) May 21.

4923

CURRENT STATUS OF INFORMATION ON THE INDUCTION OF MUTATIONS BY IRRADIATION. Herman M. Slatis (McGill Univ., Montreal, Canada). Science 121, 817-21(1955) June 10.

The current status of information on the induction of mutations by irradiation is reviewed. An attempt is made to assess the effect of irradiation on man's genes by estimating the limits within which various pertinent values lie. These limiting values are then combined to given maximal and minimal estimates of the effect of irradiation on man. The author's conclusions are presented on the effect of accidental poisoning of the atmosphere by irradiation on the mutation rate in man. (C.H.)

RADIATION HAZARDS AND PROTECTION

4924

PROTECTION AGAINST BETATRON-SYNCHROTRON RADI-

ATIONS UP TO 100 MILLION ELECTRON VOLTS. Natl. Bur. Standards (U. S. Handbook 55, Feb. 26, 1954. 52p. $0.25 (GPO).

Recommendations are presented for the protection of operating personnel, patients receiving treatment, and the public against the hazards of the various radiations produced by betatron and synchrotron sources. Protection from hazards from associated effects such as noise, electricity, and ozone are also considered. (C.H.)

RADIOTHERAPY

4925 AEC-tr-2132

FIRST ATTEMPTS AT MICROLOCALIZED RADIOTHERAPY OF THE HYPOPHYSIS AND HYPOTHALAMUS. Carlos Santos. Translated from J. Soc. ciênc. Méd. Lisboa 117, 401-60(1953). 39p.

4926

PROGRESS AGAINST CANCER WITH RADIOISOTOPES. Paul C. Aebersold (U. S. Atomic Energy Commission, Oak Ridge, Tenn.). Acta Unio Intern. contra Cancrum 10, No. 4, 203-15(1954). (In English)

The greatest value of radioisotopes to date in the cancer field has been in research on biochemical details of cancer cells and mechanisms of agents which affect these cells. The potentialities appear very promising for diagnostic tests which depend either on a selective uptake of radiomaterials by cancer tissue or by a systemic change in metabolism of a radiocompound due to the presence of cancer. However, actual diagnostic applications are still quite limited. In therapy, much hope has been placed on obtaining selective biochemical concentration of radiomaterial in cancer tissue, but here also the clinical applications are still quite limited. Greatest progress has been made in developing new ways to obtain advantageous physical placement of radiomaterials by interstitial injection, instillation into cavities, or implantation. Gamma-ray-beam devices have also been developed which produce results similar to million-volt-range x-ray equipment but which have certain advantages in obtaining desirable radiation dosage patterns. Thus, research teams find radioisotopes invaluable and indispensable tools and, although clinical teams to not find them indispensable, they are often advantageous additions to other modalities. (auth)

4927

UTILIZATION OF RADIOACTIVE ISOTOPES IN THE STUDY OF CANCER. Maurice Tubiana (Institut Gustave Roussy, Villejuif, Seine, France). Acta Unio Intern. contra Cancrum 10, No. 4, 216-29(1954). (In French)

The most important utilizations of isotopes in diagnostic and treatment of cancer were reviewed. Emphasis was placed on the treatment of thyroid cancer with radioactive iodine, 1429 cases tested and 441 cases treated reported in the literature or known by personal communication to the author were analysed and the results discussed. Uses of isotopes in clinical investigation and in experimental research on cancer were cited. (auth)

TOXICOLOGY STUDIES

4928

A CLINICAL INVESTIGATION OF THE CHRONIC EFFECTS OF RADIUM SALTS ADMINISTERED THERAPEUTICALLY (1915-1931). W. B. Looney, R. J. Hasterlik, A. M. Brues, and E. Skirmont (Argonne National Lab., Lemont, Ill. and Argonne Cancer Research Hospital, Chicago). Am. J. Roentgenol. Radium Therapy Nuclear Med. 73, 1006-37(1955) June.

The present status of a group of patients known to have received radium salts administered orally or parenterally prior to 1932 is reviewed. An analysis of several thousand roentgenograms done on 38 individuals who received radium theropeuteically and 6 individuals who had been employed as radium dial painters demonstrates a general correlation between the level of body burden of radium and the frequency and severity of osseous lesions. (C.H.)

TRACER APPLICATIONS

4929 UCRL-2933

California. Univ., Berkeley. Radiation Lab.

SYNTHESIS AND METABOLISM OF CARBONYL-C^{14} PYRUVIC AND HYDROXYPYRUVIC ACIDS IN ALGAE. Gerhard Milhaud, Andrew A. Benson, and M. Calvin. Mar. 30, 1955. 13p. Contract W-7405-eng-48.

Pyruvic and hydroxypyruvic acids are metabolized by Scenedesmus. The products of metabolism of pyruvic-2-C^{14} and hydroxypyruvic-2-C^{14} acids are essentially identical to those of $C^{14}O_2$ fixations. Lipids are rapidly formed in the light from both substrates. In the dark the major products are intermediates of the tricarboxylic acid cycle. It does not appear likely that free hydroxypyruvic acid is a photosynthetic intermediate. Tricarboxylic acid cycle intermediates are formed from exogenous pyruvate as fast in the light as in the dark. (auth)

CHEMISTRY

4930 ORDTX-10

Frankford Arsenal. Fire Control Lab., Philadelphia.

BIBLIOGRAPHY OF THIN FILMS. W. C. Zeek. June 25, 1954. 34p. (TN-1021; AD-39432)

This bibliography contains references on the preparation, structure, and properties of metal films, filters, and dielectric films. (C.H.)

4931 AEC-tr-2142

THE EFFECT OF ADDITIVES, ESPECIALLY OF ASH PARTICLES IN THE ALKALI-ACTIVATED WATER GAS PROCESS DURING NORMAL, REDUCED AND INCREASED PRESSURES. C. Kroeger and R. Schabert. Translated from Oel u . Kohle 39, 756-69(1943). 56p.

The influence of acid and alkali anhydride additions, which are mainly found in the ash of coal and coke, on the transformation of water vapor by graphite activated by alkali was investigated. The influence of several additional oxides was also studied. (C.W.H.)

4932 AEC-tr-2143

NEUTRAL ELECTRODE IN THE ELECTROCHEMISTRY OF MOLTEN SALTS. Iu. K. Delimarskii. Translated from Zhur Fiz. Khim. 24, 875-80(1950). 13p.

It is suggested that a sodium electrode be taken as a conditional neutral electrode for molten electrolytes. The advantages of a sodium electrode as a neutral electrode consist in the fact that it retains a constant value in various molten electrolytes and it can serve not only as a neutral electrode but as an electrode of comparison in the electrochemistry of molten salts as well. (auth)

4933

MOLAR VOLUME AND STRUCTURE OF SOLID AND MOLTEN CESIUM HALIDES. J. W. Johnson, P. A. Agron, and M. A. Bredig (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 2734-7(1955) May 20.

X-ray diffraction patterns of solid cesium iodide and bromide taken at temperatures up to the melting points gave no evidence of any transition from a simple cubic to a face-centered cubic structure similar to the transition which occurs in cesium chloride at 469°C. Discussion of the molar volumes of the solid and liquid salts at the melting points leads to the conclusion that the structural change from 8- to 6-fold coördination, which in the chloride takes place in solid phase at 469° occurs in the bromide and iodide at their melting points as part of the fusion process. (auth)

4934

CADMIUM SULFATE AND ITS HYDRATES. HEAT CAPACITIES AND HEATS OF HYDRATION. APPLICATION OF THE THIRD LAW OF THERMODYNAMICS. M. N. Papadopoulos and W. F. Giauque (Univ. of California, Berkeley). J. Am. Chem. Soc. 77, 2740-4(1955) May 20.

The heat capacities of $CdSO_4$, $CdSO_4.H_2O$, and $CdSO_4.{}^8/_3\ H_2O$ have been measured from 15° to 315°K. Tables of thermodynamic properties have been prepared for each of these substances. It is concluded that cadmium sulfate and its two hydrates approach zero entropy at limiting low temperatures. (auth)

4935

THE VAPOR PRESSURE OF WATER OVER AQUEOUS SULFURIC ACID AT 25°. E. W. Hornung and W. F. Giauque (Univ. of California, Berkeley). J. Am. Chem. Soc. 77, 2744-6(1955) May 20.

Direct observations of the vapor pressure of water over $H_2SO_4.4H_2O$, $H_2SO_4.3H_2O$, and $H_2SO_4.2H_2O$ have been made over a range of temperatures above 25°C. These results with available partial molal heat content and heat capacity data have been used to calculate accurate values of the partial pressure of water at 25°C. (auth)

4936

METHOD OF INTEGRATING THE RATE EQUATIONS FOR FREE RADICAL INITIATED POLYMERIZATIONS. John P. Howe (General Electric Research Lab., Schnectady, N. Y.). J. Chem. Phys. 23, 899-902 (1955) May.

A method is given for integrating the equations for the rate of polymerization reactions without the assumption of steady states for the concentrations of the various free radicals. The main reaction steps used are: free radical production, chain propagation, chain transfer, and chain termination. Explicit expressions are found for the total amount of polymer, the number average, and the weight average as a function of time for the particular case of free radicals produced initially by a pulse of light. Other modes of dependence on time for the primary free radicals may also be treated. (auth)

4937

INTERDIFFUSION IN THE GASEOUS SYSTEMS: BF_3 - CCl_4 AND BCl_3 - CCl_4. C. J. G. Raw (Univ. of Natal, Pietermaritzburg, S. Africa). J. Chem. Phys. 23, 973(1955) May.

The experimentally determined diffusion coefficients for CCl_4 vapor in gaseous BF_3 and BCl_3 at 30°C were 0.045 cm^2 sec^{-1}, respectively. These values compared favorably with the theoretical values. (C.W.H.)

4938

COMPOSITION AND PROPERTIES OF HYDROCHLORIC ACID SOLUTIONS OF NIOBIUM PENTOXIDE. S. I. Solov'ev, E. I. Krylov, and V. F. Degtyarev (Ural State Univ.). Zhur. Obshchei Khim. 25, 639-43(1955) Apr. (In Russian)

AEROSOLS

4939 AD-47796

Massachusetts Inst. of Tech., Cambridge.

THE PHOTOMETRIC MEASUREMENT OF PARTICLE SIZE (thesis). John Bane Cheatham, Jr. Sept. 1954. 74p.

The design, calibration, and testing of equipment for the photometric measurement of water droplet size in an air stream are described. (C.H.)

ANALYTICAL PROCEDURES

4940 CCC-1024-TR-103

Pennsylvania State Univ., University Park.

THE POLAROGRAPHIC ESTIMATION OF BORON. W. C. Fernelius, J. M. Schempf, and C. L. Fili, Jr. Apr. 5, 1955. 17p.

An attempt was made to develop a polarographic method for the estimation of boron. Polarographic methods based on the shift in the half wave potential or on the decrease in the diffusion current of a polarographically active organic compound which forms a complex upon the addition of borate, and an amperometric method employing solid electrodes were investigated. Only the polarographic methods proved feasible as no steady diffusion or limiting current could be obtained at the solid platinum or graphite electrode employed in the amperometric work. It is concluded that polarographic measurements of the effect of borate additions on the diffusion currents of half wave potentials of 2,2′-dihydroxybenzoin solutions can be used in the estimation of boron in the concentration range 0.7 to 1.6 millimolar. (auth)

4941 LA-1884

Los Alamos Scientific Lab., N. Mex.

THE DETERMINATION OF LITHIUM IN AIR BY THE FLAME PHOTOMETER. Evan E. Campbell, Billye M. Head, and Jean McClelland. Dec. 1954. 29p. Contract W-7405-eng-36.

Lithium in air may be determined by the removal of particulate material from an air stream on appropriate filter media. A rapid, accurate method has been developed for the determination of lithium in these air samples, using the Model 52-C Perkin-Elmer Flame photometer. The maximum sensitivity is 1 μg of lithium per milliliter of solution, using water as the solvent. Small amounts of sodium, potassium, calcium, and barium do not interfere. With glacial acetic acid as the solvent, the sensitivity is increased to 0.005 μg of lithium per milliliter of solution. The effects of various factors on the flame intensity were studied with glacial acetic acid. A suction aspirator for use with the flame photometer is described. (auth)

4942 MR-524

Frankford Arsenal. Pitman-Dunn Labs., Philadelphia.

NEPHELOMETRIC AND GRAVIMETRIC DETERMINATION OF SMALL AMOUNTS OF CALCIUM IN TITANIUM ALLOYS. M. Codell, A. Cherney, and G. Norwitz. [Feb. 1953]. 14p. (AD-7950)

A method is proposed for the determination of 0.005 to 0.3 per cent calcium in titanium alloys. The sample is dissolved in hydrochloric acid and the titanium removed by a cupferron precipitation and a chloroform extraction. The calcium remains in the aqueous solution. An ammoniacal sulfide separation is made to remove the heavy metals, and the calcium is precipitated as the sulfate from a methyl alcohol medium. For samples containing more than 0.02 per cent calcium, the calcium is weighed as calcium sulfate. For samples containing less than 0.02 per cent calcium, the calcium sulfate is dissolved in dilute nitric acid and the calcium determined nephelometrically as the stearate. For alloys containing chromium, tungsten, aluminum, or manganese, special separations are necessary. The chromium is volatilized as chromyl chloride, the tungsten filtered off as tungstic oxide, the aluminum removed as aluminum hydroxide, and the manganese separated as manganese dioxide after oxidation with persulfate. (auth)

4943 NP-5661
Horizons, Inc., Cleveland.
ANALYTICAL PROCEDURES. THORIUM PROCESS.
Ardys A. Klann. Jan. 18, 1955. 27p.

Analytical procedures used in connection with the production of Th and its salts are reported. These procedures are used on Th metal, pure salts such as the nitrate and chloride, experimental salts of unknown composition, and Th scrap metal. (L.T.W.)

4944 NP-5664
Metallurgical Advisory Committee on Titanium.
RECOMMENDED METHODS OF THE PANEL ON METHODS OF ANALYSIS. INFORMATION BULLETIN NO. T8, PART I. May 25, 1955. 73p.

Analytical procedures for the determination of trace amounts of Fe, Cr, Mo, V, Sn, Al, Mn, Ni, B, N_2, and Cu in titanium and titanium alloys are outlined. (C.W.H.)

4945 TEI-498
Geological Survey.
DETERMINATION OF THORIUM IN ZIRCON. Frank Cuttitta. Apr. 1955. 25p.

A method is presented for the separation and spectrophotometric determination of thorium in zircon and other associated minerals. The organic reagent 2-(2-hydroxy-3, 6-disulfo-1-naphthylazo)-benzenearsonic acid (thoron) is used to develop the color for the final optical measurement. The method covers a range of 3 to 230 micrograms of thoria with a precision within 10 percent in the 3 microgram range and 2 percent in the 230 microgram range. The steps necessary for the separation of interfering ions are discussed, and a study of the effect of various cations and anions is presented. (auth)

4946
PAPER CHROMATOGRAPHY OF URANIUM. Colette Soye. Compt. rend. 240, 1894-6(1955) May 9. (In French)

A method is described for identifying U in a solution of cations and anions, containing up to 100 times less U. Paper chromatography is used with water-alcohol solutions of fluorescein as the eluent. The limit of sensitivity is 0.1 γ. (tr-auth)

ATOMIC WEIGHTS AND PERIODIC SYSTEMS

4947
THE URANIDES (93-95) AND TRANS-CURIUM (97-100) ELEMENTS. Constantin Bedreag. Compt. rend. 240, 1767-9(1955) May 2. (In French)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

4948 AWRE-O-73/54
Gt. Brit. Atomic Weapons Research Establishment, Aldermaston, Berks, England.
STUDIES OF ORGANIC CRYSTALS FOR USE IN SCINTILLATION COUNTERS. PART III. THE GROWTH OF LARGE CRYSTALS OF ANTHRACENE AND TOLAN.
S. K. Hutchinson and Ruth Lapage. Feb. 3, 1955. 10p.

Methods are described for the preparation of large crystals of anthracene and tolan for use in scintillation detectors. (C.H.)

4949 ISC-594
Ames Lab., Ames, Iowa.
THE ALLOTROPIC MODIFICATIONS OF CALCIUM. J. F. Smith, O. N. Carlson, and R. W. Vest. Apr. 8, 1955. 21p. Contract W-7405-eng-82.

X-ray-diffraction patterns run on calcium samples of different purities have shown that $99.9^+\%$ Ca exists in only two allotropic forms: face-centered cubic to 464°C and body-centered cubic from 464°C to the melting point. These results for the high-temperature allotrope differ from the widely accepted structure; handbooks and tables currently list the high-temperature allotrope as hexagonal closest-packed. It has been further shown that a previously reported intermediate allotrope of complex structure is due to contamination. The temperature dependence of the electrical resistivity of the $99.9^+\%$ Ca was found to be linear for both the face-centered cubic allotrope and for the body-centered cubic allotrope. Calcium was observed to be self-annealing at room temperature. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

4950 NBS-3679
National Bureau of Standards, Washington, D. C.
A REVIEW OF THE REACTION KINETICS OF DEUTERIUM COMPOUNDS. II. DECOMPOSITION REACTIONS OF ORGANIC COMPOUNDS. Lawrence M. Brown and Abraham S. Friedman. Oct. 15, 1954. 118p.

The kinetics of decomposition reactions of organic deuterium compounds are reviewed. The following classes of compounds are covered: hydrocarbons, aldehydes, ketones, peroxides, acids, azo compounds, and amines. Also covered are the compounds: diacetone alcohol, 2-pentachlorosulfite, chloroform, benzoquinhydrone, d-sucrose, and d-glucose. The review treats both thermal and photochemical decompositions in the liquid and gas phases, and contains tabular summaries of the experimental data for most of the reactions discussed. (auth)

FLUORINE AND FLUORINE COMPOUNDS

4951 NP-5654
Florida. Univ., Gainesville.
PREPARATION OF FLUORINE CONTAINING COMPOUNDS. QUARTERLY TECHNICAL REPORT [FOR] PERIOD FEBRUARY 1, 1955 TO APRIL 30, 1955. R. D. Dresdner, Henry C. Brown, J. A. Wethington, Jr., and J. A. Young. 17p. Contract Nonr-580(03).

Equipment used in the electrochemical method of preparing fluorine-containing materials is described.

Topics discussed include: attempts to prepare $CH_3N(CH_2COCl)_2$; the preparation of $CH_3N(CH_2COOCH_3)_2$; electrochemical operations using dimethylacetamide; the preparation of adipyl chloride; the preparation of $(CH_3)_2NCOCl$; the reduction of fluorocarbon olefins with elementary sulfur; the reaction of fluorocarbon derivatives with compounds containing sulfur; and the preparation of fluorocarbon amidines. (C.H.)

4952 WADC-TR-52-191(Pt.3)
Purdue Univ., Lafayette, Ind.
[SYNTHESIS AND EVALUATION OF NEW POLYMERS]. FLUORINE CONTAINING ELASTOMERS. Earl T. McBee and Carleton W. Roberts. Dec. 1954. 120p. Contract AF33[038]-20581.

Part 1 of this report, WADC-TR-52-191(Pt.1), prepared by Purdue Research Foundation.

Six fluorine-containing silanes were prepared and submitted for polymerization studies. Difunctional silanes containing perfluoroalkyl groups separated from the silicon atom by an ethylene spacer were prepared in good yield. Difunctional silanes containing perfluoroalkyl groups separated from the silicon atom by a methylene spacer were successfully synthesized, and difunctional silanes containing perfluoroalkyl groups directly attached to the silicon atom were prepared. (auth)

4953 WADC-TR-52-197(Pt.4)
Minnesota Mining and Manufacturing Co., St. Paul.
SYNTHETIC RUBBERS FROM CARBON-FLUORINE COMPOUNDS. F. A. Bovey. Jan. 1955. 132p. Contract AF33(038)-515.

The preparation and properties of fluorine-containing rubbers are describes. The object of the work is the development of elastomeric materials which are resistant to the fuels, lubricants, and hydraulic fluids used in military aircraft and which are serviceable over the widest possible temperature range. The materials developed which appear to be of chief interest are: copolymers of perfluorobutadiene with 1, 1-dihydroperfluoroalkyl vinyl ethers, offering promising high temperature resistance, low swelling in aircraft fluids, and high resistance to ozone. Difficulties have been experienced in preparing products of consistent quality, and in effectively vulcanizing and stabilizing the copolymers. In addition to the 1, 1-dihydroperfluoroalkyl acrylates, newer classes of fluoroacrylates have been synthesized. Of particular interest are the γ-(perfluoroalkoxy)-1,1-dihydroperfluoropropyl acrylates, which offer solvent resistance at least equal to that of the earlier series but are flexible at temperatures 25°C lower than the polymers of the 1,1-dihydroperfluoroalkyl acrylates. The mechanism of the polyamine vulcanization reaction has been shown to be amide formation. Extensive testing of vulcanizates of poly-1, 1-dihydroperfluorobutyl acrylate (poly-FBA) prepared in poly-amine-curing recipes has indicated excellent resistance to a variety of liquids at high temperature. A thorough study of the molecular weight and fundamental solution properties of poly-FBA has been carried out. (auth)

4954 WADC-TR-55-193
Dow Corning Corp., Midland, Mich.
FLUORINE-CONTAINING POLYETHERS. Ogden R. Pierce, Donald D. Smith, and Robert M. Murch. Apr. 1955. 60p. Contract AF33(616)-2417.

Appreciable quantities of the two monomers, $CF_3\overline{CH-CH_2O}$ and $CF_3\overline{C(CH_3)CH_2O}$ have been prepared by reactions involving the dehydrohalogenation of the corresponding halohydrins. Dehydrohalogenation studies were conducted using the following halohydrins: $CClF_2CH_2OH$, CCl_2FCH_2OH, $CClF_2CHOHCCl_2F$, $CClF_2CHOHCClF_2$, and $CCl_2FCHOHCCl_2F$. The corresponding epoxides were not obtained but rather extensive decomposition of the organic reactants was observed. An investigation of the hypochlorination of the olefins $CH_2 = CF_2$, $CF_3C(CH_3) = CH_2$, and $C_3F_7CH = CH_2$ is in progress. The results are inconclusive at this time. The preparation of a polyglycol formal was accomplished by reaction of a fluorine-containing glycol with dibutyl formal. The material was found to be thermally unstable. The polymerization of both $CF_3\overline{CHCH_2O}$ and $CF_3\overline{C(CH_3)CH_2O}$ was accomplished using ferric chloride as a catalyst. In addition, copolymers of these two monomers were prepared in a similar manner. (auth)

4955 AEC-tr-2151
PREPARATION AND PROPERTIES OF POLYMERS CONTAINING FLUORINE. G. Bier, R. Schäff, and K. H. Kahrs. Translated from Angew. Chem. 66, 285-92(1954). 20p.

The syntheses and properties of several polymers containing fluorine are outlined. The influence of the C-F bond character on the properties of fluoroörganic compounds is discussed. (C.W.H.)

LABORATORIES AND EQUIPMENT

4956
MIXING MACHINE OF HIGH PRECISION FOR STUDY OF RAPID REACTIONS. W. R. Ruby (Eastman Kodak Co., Rochester, N. Y.). Rev. Sci. Instr. 26, 460-2(1955) May.

The mixing machine described was designed for use in the study of certain rapid reactions by the steady-state-of-flow method. This machine combines several features not previously described for a single machine. (1) It may be used for reactions whose range of half-reaction times varies from 6 msec to 1.6 sec. This wide range is obtained by varying syringe piston speed to change the velocity of flow and by inserting spacer units to increase the length of reaction path. (2) It gives results of high precision when used with the "chemical stop" method. The combination of precision-machined syringes and sensitive sampling and timing mechanism gives data from which precise calculations of velocities of flow and reaction time can be made. (3) The combination of three separate mixing chambers with or without spacer units enables one to premix sensitive reagents, immediately before initiating the primary reaction. The performance of the machine was evaluated by measuring the rates of a first-order reaction using the steady-state-flow technique. (auth)

MOLECULAR STRUCTURE

4957
SPECTRA AND ELECTRONIC STRUCTURE OF FLUOROCHROMATE ION, CHROMYL CHLORIDE, AND SOME RELATED COMPOUNDS. Lindsay Helmholz and Harry Brennan (Washington Univ., St. Louis, Mo.) and Max Wolfsberg (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 23, 853-8(1955) May.

A semiempirical treatment, which gives satisfactory agreement between calculated and observed spectra for chromate and permanganate ion, has been employed to calculate the excited state energies and transition moments for the related molecules of the chemical formulas CrO_3X^- and CrO_2X CrO_2X_2. The results show agreement with experimental data which unfortunately are not extensive for these molecules. The calculations indicate an absorption for SO_2Cl_2 in the farther ultraviolet in agreement with experiment. The qualitative significance of the results, so far as the relative importance of σ and π bonding, is discussed. (auth)

RADIATION CHEMISTRY

4958 AD-28235
Brooklyn. Polytechnic Inst.
NEW POLYMERIZATION METHODS. QUARTERLY REPORT NO. 6. FINAL REPORT [FOR] JULY 1, 1952 TO JANUARY 31, 1954. Norman Byrd, Robert B. Mesrobian, Donald J. Metz, and Robert Zand. Jan. 31, 1954. 8p. Contract N123s-S1517, T. O. 1.

Experiments are described which demonstrate that crystalline acrylamide undergoes polymerization upon irradiation with γ rays from an intense Co^{60} source. Below its melting point the monomer shows little or no tendency to polymerize thermally. Samples of the polymer were prepared and rate curves were obtained at 5°, 35°, and 55°C. (ASTIA abst.)

4959 KAPL-1337
Knolls Atomic Power Lab., Schenectady, N. Y.
THE BETA-PARTICLE RADIOLYSIS OF ACETYLENE. L. M. Dorfman and F. J. Shipko. May 16, 1955. 21p. Contract W-31-109-Eng-52.

The beta-particle radiolysis of acetylene has been investigated at room temperature for the system tritium-acetylene. The 100 ev yields for the over-all rate of disappearance of acetylene, to form cuprene and benzene, the only volatile product, and of benzene formation are $-G_{C_2H_2} = 71.9$ and $G_{C_6H_6} = 5.1$. The fraction of the acetylene going to form benzene is independent of acetylene pressure and radiation intensity, and has an average value of 0.21. Since the ratio of the rates of cyclization and polymerization is independent of acetylene pressure, the two processes are not competitive for the same trimer intermediate. A mechanism is suggested in which the reaction paths are determined by the formation of different excited states of acetylene. Cyclization is initiated by an excited molecule, in a triplet state, which may have a bent configuration. Such a state has been characterized in a recent analysis of the acetylene ultraviolet spectrum by Ingold and King. Experiments with deutero-acetylene show that exchange occurs between the isotopic acetylene molecules, indicating that carbon-hydrogen bond rupture does occur in the radiolysis. (auth)

4960
DECOMPOSITION OF CARBON DIOXIDE BY IONIZING RADIATION. PART 1. P. Harteck and S. Dondes (Rensselaer Inst., Troy, N. Y.). J. Chem. Phys. 23, 902-8(1955) May.

The irradiation of gaseous carbon dioxide with radon or in a nuclear reactor, produces about 0.1 percent decomposition of primarily dissociated carbon dioxide, correlating with previous results in the literature. The irradiation of solid carbon dioxide with radon produces carbon monoxide and oxygen with a G value of 9 to 10. The irradiation of gaseous carbon dioxide, containing a small amount of nitrogen dioxide, by radon or in a nuclear reactor, produced carbon monoxide and oxygen, with a G value of 9 to 10. Percentages as small as 0.5 percent of nitrogen dioxide are sufficient to stop the back reaction to carbon dioxide. A new mechanism has therefore been proposed for the ineffectual decomposition of carbon dioxide by ionizing radiation, and the effective decomposition when nitrogen dioxide is present. With the proposed mechanisms, the classical experiments of Lind, the carbon monoxide oxidation and the carbon monoxide decomposition, are quantitatively explained. (auth)

RADIATION EFFECTS

4961 WADC-TR-55-57
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
VULCANIZATION OF RUBBER WITH HIGH-INTENSITY GAMMA RADIATION. [PERIOD COVERED: MAY 1954 TO MARCH 1955]. Wallace W. Jackson and Denver Hale. Apr. 1955. 36p.

Techniques of vulcanizing both natural and synthetic rubber polymers, using high-intensity γ radiation, are described. Evaluation of this technique shows considerable promise in developing elastomers for specialized uses. (auth)

4962
RESPONSE OF ANTHRACENE AND STILBENE TO LOW-ENERGY PROTONS AND X-RAYS. J. M. Fowler and C. E. Roos (Johns Hopkins Univ., Baltimore). Phys. Rev. 98, 996-9(1955) May 15.

The scintillation response of anthracene and stilbene to low-energy protons (170 to 570 kev) and x rays (10 to 40 kev) has been investigated. In agreement with previous work at higher proton energies, the proton pulse height vs. energy curves are quite nonlinear. The x-ray data are essentially linear down to 10 kev. This result is contrary to the reported response of these crystals to electron bombardment, but seems to be in agreement with the theory proposed by Birks. With the aid of this theory, proton response curves are obtained for stilbene and anthracene over an extended energy range. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

4963
THE STATES ^1I OF TRIVALENT PRASEODYMIUM AND THULIUM. Chr. Klixbull Jørgensen (Technical Univ. of Denmark, Copenhagen). Acta Chem. Scand. 9, No. 3, 540-2 (1955).

4964
SPECTROPHOTOMETRIC STUDIES OF CEROUS CITRATE COMPLEXES. Jolanda M. Hojman. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 89-106(1955) Mar.

The effect of pH and that of the concentration of citric acid upon the absorption spectra of $CeCl_3$ was investigated. The composition of the cerous citrate complexes at different pH was determined by the method of continuous variations. The approximate values of apparent formation constants and those of molecular extinction coefficients of the complexes were given. (auth)

4965
STUDIES IN LOW CONCENTRATION CHEMISTRY. X. FURTHER OBSERVATIONS ON YTTRIUM. George K. Schweitzer and Harrison E. Scott (Univ. of Tennessee, Knoxville). J. Am. Chem. Soc. 77, 2753-5(1955) May 20.

Centrifugation and adsorption experiments were carried out in an investigation of the radiocollodial properties of Y at tracer concentrations. The observation that Y in very low concentrations forms aggregates under certain solution conditions is verified. The results of solvent extractions from water into acetylacetone and adsorption upon carbon at various pH values are reported. (C.W.H.)

4966

POTENTIOMETRIC INVESTIGATION OF PRECIPITATION OF Ce(IV) and Ce(III) IN RELATION TO EFFECT OF SOLUTION pH ON MAGNITUDE OF OXIDATION-REDUCTION POTENTIAL OF Ce^{+4}/Ce^{+3} SYSTEMS. T. N. Bondareva and A. G. Strombery (Ural State Univ.). Zhur. Obshckei Khim. 25, 666-71(1955) Apr. (In Russian)

Hydrates of Ce(III) and Ce(IV) hydroxides are investigated.

SEPARATION PROCEDURES

4967 ISC-590

Ames Lab., Ames, Iowa.

SOLVOLYSIS OF HAFNIUM AND ZIRCONIUM TETRACHLORIDES IN METHYL AND ETHYL ALCOHOLS. Clyde R. Simmons and Robert S. Hansen. Mar. 24, 1955. 8p. Contract W-7405-eng-82.

Solvolysis of hafnium tetrachloride and zirconium tetrachloride was more extensive in methanol than in ethanol. Solvolysis of $HfCl_4$ was more extensive than that of $ZrCl_4$ in both solvents, the difference being greater in methanol than in ethanol. (auth)

4968

ION EXCHANGE. F. J. Van Antwerpen, ed. Chem. Eng. Progr. 50, Symposium Ser. No. 14, 1954. 121p. $4.25.

Thirteen papers are presented on the theory and practical applications of ion-exchange processes. Emphasis was placed on the countercurrent ion exchange process. (C.W.H.)

SORPTION PHENOMENA

4969 NP-5663

Texas. Univ., Austin.

ELECTRODE PROCESSES. TECHNICAL REPORT NO. 1. INTERACTION OF CHROMIUM(VI) ANIONS WITH CHROMIUM METAL SURFACES. L. O. Morgan and S. Kottle. May 1955. 61p. Contract Nonr-375(04).

The adsorption of Cr^{6+} on chromium metal surfaces and the resultant electrode potential changes have been correlated with the pre-treatment of the chromium metal and with variations in the surfaces arising in differences in measured roughness. The electrode potential changes were ascribed in part to incorporation of polarized anions in the electronic double layer associated with the metal surfaces. (C.W.H.)

SPECTROSCOPY

4970 ISC-602

Ames Lab., Ames, Iowa.

A ROTATING STEP SECTOR FOR USE WITH AC OR OTHER INTERMITTENT SPECTROGRAPHIC LIGHT SOURCES. Richard N. Kniseley and Velmer A. Fassell. May 9, 1955. 13p. Contract W-7405-eng-82.

The design and performance of a rotating step-sector are given. Data are presented to show that the random spacing of the sector apertures eliminates the possibilities of introducing errors through synchronization effects when conventional intermittent discharges are used. (C.W.H.)

SYNTHESES

4971 AD-32661

Brooklyn. Polytechnic Inst. [Polymer Research Inst.]

SYNTHESIS OF HEAT RESISTANT POLYMERS. QUARTERLY REPORT NO. 10. FINAL REPORT COVERING THE INTERVAL FROM JUNE 1, 1951 TO JANUARY 31, 1954. Robert B. Mesrobian. Jan. 30, 1954. 17p. Contract DA-36-039-sc-5588.

Samples of pure polyethylene film of 4 mil thickness and 1-in.-diam rod were subjected to varying γ-ray exposures. An evaluation was made of the effect of radiations on the tensile strength, ultimate elongation, tensile creep, recovery after creep, heat distortion, and chemical changes as measured by the IR spectra. Tensile strength was reduced by irradiation, and a drastic reduction was noted in ultimate elongation. Cross linkage resulting from irradiation reduced the visco-elastic deformation; after extensive exposure, no visco-elastic deformation was observable between 10 and 10^3 sec. Complete recovery of the deformation was observed after short irradiations. Heat distortion improved with an increase in irradiation. A sample irradiated to 40 Mrep exhibited the same heat deformation at 132°C after 10 min as an unirradiated sample at 90°C. The IR data showed the progress of saturation and the formation of oxygen containing functional groups by irradiating. A lower concentration of carbonyl and OH groups was produced with γ rays at −18°C than with high-energy electrons or with γ rays at 25°C. (ASTIA abst.)

4972 CCC-1024-TR-104

Pennsylvania State Univ., University Park.

SUB-BORIC ACID AND BORON MONOXIDE. T. Wartik and E. Apple. Apr. 8, 1955. 4p.

Sub-boric acid, $B_2(OH)_4$, and a new form of boron monoxide, BO, have been prepared and characterized. (auth)

4973 UCRL-2934

California. Univ., Berkeley. Radiation Lab.

S-ACYL THIOCTIC ACID DERIVATIVES IN AEROBACTER AEROGENES AND SCENEDESMUS. Gerard Milnaud, Andrew A. Benson, R. Clinton Fuller, Vera Milhaud, and M. Calvin. Mar. 30, 1955. 9p. Contract W-7405-eng-48.

Acetyl thioctic acid has been prepared chemically, and its chromatographic and acetylating behavior is described. A C^{14}-containing substance has been found in Scenedesmus, photosynthesizing in the presence of α-C^{14}-pyruvate, which has properties suggesting that it is acetyl thioctic acid. A C^{14}-containing substance has been found in Aerobacter aerogenes, metabolizing α-C^{14}-pyruvate, which shows the properties of a labile conjugate of thioctic acid with some relatively polar groups. Acetyl thioctic acid is formed in vitro when light acts on a solution of thioctic acid and pyruvate. (auth)

4974

SYNTHESIS OF ANHYDROUS METAL HALIDES. George W. Watt, Philip S. Gentile, and E. P. Helvenston (Univ. of Texas, Austin). J. Am. Chem. Soc. 77, 2752-3(1955) May 20.

Anhydrous metal halides may be produced in quantitative yield by the interaction of the appropriate hydrated metal acetate with acetyl halide in benzene. (C.W.H.)

4975

STUDIES OF URANIUM MINERALS. XVII. SYNTHETIC SCHROECKINGERITE. Virginia Ross (Harvard Univ., Cambridge, Mass.). Am. Mineralogist 40, 515-19(1955) May-June.

TRANSURANIC ELEMENTS AND COMPOUNDS

4976 WASH-527

Knolls Atomic Power Lab., Schenectady, N. Y.

VISIT OF AECL PERSONNEL TO KAPL AND KAPL

PERSONNEL TO AECL AS PART OF A JOINT STUDY OF HIGHLY IRRADIATED PLUTONIUM. R. P. Schuman. May 12, 1955. 8p. (Visit No. 316)

The processing of a sample of highly irradiated Pu is described, and identification of short-lived heavy nuclides is discussed. Preliminary data are included on nuclear properties of isotopes of elements 98, 99, and 100. (C.H.)

4977
ISOTOPIC SHIFT IN THE SPECTRUM OF PLUTONIUM. A. R. Striganov, L. A. Korostyleva, and Yu. P. Dontsov. Zhur. Eksptl'. i Teoret. Fiz. 28, 480-4(1955) Apr. (In Russian)

Measured isotopic shifts between Pu^{239} and Pu^{240} for 19 lines in the region 4100 to 6500 A are reported, and the electron configuration of the Pu atom is discussed. (G.Y.)

URANIUM AND URANIUM COMPOUNDS

4978 ANL-5122
Argonne National Lab., Lemont, Ill.
SPECTROSCOPY OF URANYL SALTS IN THE SOLID STATE. Eugene Rabinowitch. Nov. 1953. Changed from OFFICIAL USE ONLY Apr. 7, 1955. 73p. Contract W-31-109-eng-38.

Early investigations in the field of spectroscopy of uranyl salts in the solid state are reviewed, and a detailed summary is presented of the results of Nichols and Howes, and Dieke and co-worker. Topics discussed include a qualitative interpretation of the uranyl spectrum, studies of the fluorescence and absorption spectra of solid uranyl salts, the infrared spectrum of uranyl salt crystals, analysis of the uranyl spectrum, and spectroscopic data on some uranyl salts. (C.H.)

ENGINEERING

4979 NACA-TN-3402
Lewis Flight Propulsion Lab., Cleveland.
BOUNDARY LUBRICATION OF STEEL WITH FLUORINE- AND CHLORINE-SUBSTITUTED METHANE AND ETHANE GASES. S. F. Murray, Robert L. Johnson, and Max A. Swikert. [Dec. 20, 1954]. 17p.

Sliding-friction experiments were made with steel surfaces in atmospheres of halogenated gases. Under the conditions of this investigation, the most stable or fully fluorinated gases gave no surface protection. Several fluorinated compounds containing two or more chlorine atoms per molecule served as effective boundary lubricants (reduced friction and prevented excessive wear, surface welding, and metal transfer) in a manner comparable with a conventional liquid lubricant. Run-in procedure, bearing materials, and moisture availability appear to be critical in boundary lubrication by gaseous materials. (NACA abst.)

4980 NYO-7170
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. PROGRESS REPORT. Apr. 30, 1955. 55p. Contract AT(30-1)-956. (MITS-27)

Progress is reported in adsorption studies of flotation agents on silver iodide; studies on the electrochemical properties of silver sulfide; electrochemical studies of adsorption on lead sulfide surfaces; adsorption of sodium and chloride ions on quartz; adsorption of copper and silver on sphalerite; activation of sphalerite by lead; streaming potential studies on corundum; solubilities of metal xanthates; flotation kinetics of air bubbles in aqueous media; the solvent extraction of complexed metal ions; size distribution studies on particles in the $-10\ \mu$ range; and equipment for the production of fine powders. (For preceding period see NYO-6262.) (C.H.)

4981 WADC-TR-54-576(Pt. 1)
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
[HYDRAULIC FLUIDS AND LUBRICANTS]. EFFECT OF METALS ON LUBRICANTS. PART 1. DESIGN, DEVELOPMENT AND INSTRUMENTATION OF A HIGH TEMPERATURE BATH. Vernon A. Lauer. Feb. 1955. 13p.

The design, development, and instrumentation of a high-temperature bath capable of attaining and controlling temperatures up to 700 ± 1.0°F are described. (L.T.W.)

4982
MINERAL ENGINEERING TECHNIQUES. F. J. Van Antwerpen, ed. Chem. Eng. Progr. 50, Symposium Ser. No. 15, 1955. 96p. $3.75.

Various separation techniques and sizing and concentration devices are discussed in papers presented at a symposium on mineral engineering. Theoretical background, design and cost considerations, and industrial uses are emphasized. 15 papers. (C.W.H.)

HEAT TRANSFER AND FLUID FLOW

4983 NP-5641
Stanford Univ., Calif.
COMPACT HEAT EXCHANGERS—A SUMMARY OF BASIC HEAT TRANSFER AND FLOW FRICTION DESIGN DATA. W. M. Kays and A. L. London. Nov. 15, 1954. 204p. Contract N6-onr-251, T. O. 6, Technical Report No. 23.

Since 1948, 22 reports have been issued covering the results of experimental and analytical work on the basic heat transfer and flow friction characteristics of compact heat transfer surfaces. The present report brings together under a single cover, employing a common treatment, a summary of all of the basic design data in the previous reports. There are included data obtained as part of a similar project at the USN Engineering Experiment Station, Annapolis, Maryland, and data of other investigators in regions of interest not covered by the ONR or Engineering Experiment Station projects. The result is a comprehensive treatment of compact heat transfer surfaces that includes all of the major types in use today. The method of presentation was selected with a view to making the results of the Stanford-ONR program readily useful to heat exchanger designers. Types of surfaces considered are: tube banks, including both circular and flattened tubes, with both inside and outside flow; plate-fin surfaces, with a variety of fin types; finned tube surfaces, with both circular and flat tubes and various types of fins; and screen and sphere matrix surfaces. In all, 88 surface configurations are considered. Most of the basic heat transfer and flow friction design data are presented as the Colburn factor, $N_{St}N_{Pr}^{2/3}$, and f (friction factor) versus the

Reynolds number, N_R. Other or additional parameters are used where necessary. In addition to the basic design data, a chapter is devoted to heat exchanger performance theory, developed about the effectiveness versus number of heat transfer units (NTU) concept. Use of the data and the theory is illustrated by sample problems in an appendix. Another appendix contains the thermodynamic and transport properties of air, water, and gaseous combustion products needed by the designer. (auth)

4984 WADC-TR-54-70
Minnesota. Univ., Minneapolis.
[NONCIRCULAR DUCT HEAT TRANSFER COEFFICIENTS]. SURVEY ON HEAT TRANSFER AT HIGH SPEEDS. Ernst R. G. Eckert. Apr. 1954. 99p. Contract AF33(616)-2214. (AD-38093)

A survey has been made of the literature on heat transfer at high supersonic velocities published in the last three years. The large number of papers made it necessary to restrict the survey essentially to surfaces along which the pressure is constant, an assumption which is not too restrictive since evidence could be presented that for slender shapes as generally used in high speed aircraft the influence of a pressure variation on heat transfer is small. Simple relations have been collected or developed which permit the calculation of friction factors, recovery factors, and heat transfer coefficients for laminar boundary layer flow along surfaces of constant temperature with an accuracy better than 3%. A greater uncertainty in the prediction of the above parameters is caused by the poor knowledge of Prandtl number values for air at high temperatures. A decided advantage of the relations presented in this report lies in the fact that they appear to hold for any reasonable Prandtl number variation. Relations for friction, recovery, and heat transfer have also been recommended for turbulent boundary layers. A method has been described by which the effect of an arbitrarily varying temperature along the surface can be established. The influence of the molecular structure of air appearing at flight at high altitude and of dissociation occurring at high flight velocities has been discussed. From this discussion specifically as well as from the survey generally the regimes became apparent in which future research is of special engineering importance. (auth)

4985 AEC-tr-2165
WANITSCHEW METHOD OF ELEMENTARY BALANCES FOR THE CALCULATION OF TRANSIENT HEAT FLUXES. G. Sarukhanian. Translated from *Forsch. Gebiete Ingenieurw.* 19B 101-4(1953). 8p. Available from Associated Technical Services (Trans. 81G5G), East Orange, N. J.

The computational method for the claculation of temperature fields in cooling or heating processes is outlined. The temperature dependences of the specific heat and the thermal conductivity are discussed. (C.W.H.)

MATERIALS TESTING

4986 APEX-186
General Electric Co. Aircraft Nuclear Propulsion Project, Cincinnati.
THERMAL CONDUCTIVITY OF METAL COMPOSITES. E. B. Masters. Jan. 5, 1954. 6p. (XDC-54-1-13)

The thermal conductivity of a metallic insulation material is compared with that of Thermoflex mineral wool insulation at several temperatures. The metallic specimen, the test apparatus, and the calculation procedure are described in detail. (auth)

4987 TAM-81
Illinois. Univ., Urbana.
THE BEHAVIOR OF MATERIALS UNDER REPEATED STRESS. TECHNICAL REPORT NO. 41. A WIRE FATIGUE MACHINE FOR THE INVESTIGATION OF THE INFLUENCE OF COMPLEX STRESS HISTORIES. H. T. Corten and G. M. Sinclair. Apr. 1955. 29p. Contract N6ori-071(04).

A wire fatigue testing machine is described that operates on the principle of a deflected rotating strut. This equipment was designed to investigate fatigue life for complex stress histories, particularly those consisting of repeated blocks of cycles. With this wire machine the stress amplitude may be changed rapidly from one level to another without inducing noticeable vibration in the wire specimen. For a comparative study of material behavior, wire fatigue testing incorporates several particularly desirable features, namely inexpensive specimens and small scatter of data. The results of constant stress amplitude tests of steel wire are presented and analyzed statistically. (auth)

TRACER APPLICATIONS

4988 WADC-TR-54-100(Pt.1)
North Carolina State Coll., Raleigh.
BOUNDARY LAYER RADIOACTIVE TRACER TECHNIQUE. PART 1. INSTRUMENTATION. Frances M. Richardson, James K. Ferrell, and Kenneth O. Beatty, Jr. Aug. 1954. 106p. Contract AF33(616)-31.

A new technique for the measurement of velocity profiles in flowing fluids has been shown to be applicable to measurements on liquids in laminar flow in round tubes. The technique based on displacement of a radioactive or dye solution from the tube has been used successfully for velocity measurements to within 0.002 inch of the wall of a one-half inch diameter tube. Still closer measurements appear possible with minor modifications of procedure. Application of the tracer-displacement technique with radioisotopes has required development and construction of radiation counting equipment of unusual design. The equipment uses a scintillation detector and can record and operate at counting rates in excess of 500,000 counts per second. Photomultiplier tubes are used in a dual pulse-counting and current-integrating arrangement so that instantaneous count rates may be obtained under conditions where the counting rate is decreasing 50% per second. Use of dyes as tracers was made possible by adaptation of a spectrophotometer for continuous recording. The results are presented of eight sets of velocity profile measurements made using radioactive sodium carbonate solution. Six of these made using water as the solvent showed good results down to within 0.015 inch of the tube wall. Two others made using aqueous glycerine as a solvent showed excellent results down to within 0.0025 inch of the tube wall. The present limiting factor is shown to be molecular diffusion of the tracer element, and further reduction of this appears readily possible. Results of measurements using dye as a tracer have been equally successful. The dye procedure and some results are given. (auth)

WASTE DISPOSAL

4989 NP-5670
Mine Safety Appliances Co., Callery, Penna.
UNDERWATER DISPOSAL OF SODIUM WITH EB NOZZLE. W. Milich and E. C. King. June 14, 1955. 12p. Contract NObs-65426, Technical Report No. 39.

Sodium at 350°F and 50 psig nitrogen pressure was discharged through a nozzle of the current EB design (free area of approximately 0.103 sq in.) at a water depth of 5 ft with a maximum flow rate of approximately 45 lb/min. The reaction resulted in some hydrogen flames at intervals among the waves near the surface with very little sodium oxide smoke. Based on the results of this test it appears feasible to safely dispose of such quantities of sodium under 5 ft of water without any immediate danger of surface reactions or detonations. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

4990 AD-5752
Purdue Univ., Lafayette, Ind.
PREPARATION AND PROPERTIES OF REFRACTORY COMPOUNDS OF SILICON AND GERMANIUM. TECHNICAL REPORT NO. 3 [COVERING PERIOD] JUNE 1951–JUNE 1952. THE PREPARATION AND PROPERTIES OF α- AND β-$ThSi_2$. Alan W. Searcy and E. Leland Jacobson. Mar. 1953. 11p. Contract N7onr-394/12.

The existence of the β $ThSi_2$ was demonstrated by the use of x-ray diffraction patterns taken of thorium–silicon systems which were reacted at temperatures above 1400°C. The β modification is more stable than the α form at high temperatures. The melting point of β $ThSi_2$ is 1640 ± 40°C. (C.W.H.)

4991 AD-29415
Firth Sterling, Inc., Pittsburgh.
TITANIUM–CARBIDE PROGRAM. QUARTERLY PROGRESS REPORT NO. 5 FOR THE PERIOD DECEMBER 1, 1953 TO MARCH 1, 1954. LETTER REPORT NO. 15. Walther L. Havekotte. Mar. 3, 1954. 16p. Contract AF 33(600)-22992.

Stress-rupture and impact tests were carried out on several cermets of TiC bases. It was found that the impact resistance was at a maximum when a small amount of Cr_2C_3 was present. The thermal expansions of TiC over several temperature ranges were determined. (C.W.H.)

4992 AD-32275
American Electro Metal Corp., Yonkers, N. Y.
INVESTIGATION OF THE EFFECT OF RAW MATERIAL PRODUCTION VARIABLES ON THE PHYSICAL AND CHEMICAL PROPERTIES OF CARBIDES, NITRIDES, AND BORIDES. PROGRESS REPORT NO. 12 FOR THE PERIOD MARCH 1, TO APRIL 30, 1954. H. Blumenthal. 22p. Contract AF 33(616)-89.

The effects on TiC properties of O picked up during ball-milling and an addition of Mo_2C were investigated. Low percentages of the impurities did not affect the transverse rupture strengths of hot-pressed bars, but the presence of Mo_2C improved densification. (ASTIA abst.)

4993 NP-5650
Brush Labs. Co., Cleveland.
A MICROSTRUCTURE STUDY OF BARIUM TITANATE CERAMICS. TECHNICAL REPORT NO. 6. Frank Kulcsar. May 6, 1955. 18p. Contract Nonr-1055(00).

Polishing and etching techniques suitable for the metallographic examination of polycrystalline barium titanate ceramics are described. Interpretation of the photomicrographs reveals information which may be correlated with the electromechanical properties. (auth)

CORROSION

4994 AECU-3032
Case Inst. of Tech., Cleveland.
AN INVESTIGATION OF SCALING OF ZIRCONIUM AT ELEVATED TEMPERATURES. QUARTERLY STATUS REPORT NO. 8 [FOR] MARCH 2, 1955 TO JUNE 2, 1955. W. M. Baldwin, Jr., H. M. Green, and H. E. Tuchschmid. June 3, 1955. 6p. Contract AT(11-1)-258.

A brief study was made of the growth of Zr when exposed to a mixture of O_2 and N_2 at 900°C to determine the relation of the growth to the composition of the atmosphere. The surface layers of the metal were found to be a factor responsible for the accelerated reaction. (J.E.D.)

GEOLOGY AND MINERALOGY

4995 AECU-3029
Wisconsin. Univ., Madison.
THE GEOCHEMISTRY OF URANIUM AND RECOVERY FROM LOW GRADE ORES. RESEARCH PROGRESS REPORT [FOR] PERIOD JANUARY 1, 1954 TO DECEMBER 31, 1954. 19p. Contract AT(11-1)-178.

4996 GPR-1/55
Canada. Dept. of Mines and Technical Surveys. Mines Branch.
RADIOACTIVITY DIVISION GENERAL PROGRESS REPORT [FOR] JANUARY–MARCH 1955. Apr. 26, 1955. 36p.

The status of the work on ore dressing and extractive metallurgy, analytical methods for U and other elements, radiation detection instruments, and investigations of ores from private companies and individuals is presented. No technical data are reported. (For preceding period see GPR-4/54.) (J.E.D.)

4997 ORO-138
Tennessee. Univ., Knoxville.
AN INVESTIGATION OF THE CHATTANOOGA BLACK SHALE OF TENNESSEE AS A SOURCE OF URANIUM. PROGRESS REPORT FOR JULY 1, 1954 TO DECEMBER 31, 1954. Paris B. Stockdale. Jan. 3, 1955. 17p. Contract AT(40-1)-1337.

Progress is reported in an investigation of the geologic picture of the Chattanooga shale in Tennessee and the distribution of U in the shale. Results are reported from surveys in Sumner, Coffee, Bedford, and Moore Counties. (For preceding period see ORO-130.) (C.H.)

4998 RME-3110(Pt. II)
Columbia Univ., New York.
ANNUAL REPORT FOR JUNE 30, 1954 TO APRIL 1, 1955. PART II. PROGRESS REPORT ON THE MINERALS FROM THE DELTA DEPOSIT, EMERY COUNTY, UTAH. P. K. Hamilton. May 1955. 12p. Contract AT(30-1)-702.

A mineralogical study of a suite of specimens from the

Delta deposit which is located along the Muddy River at the southern bend of the San Rafael Swell, Emery County, Utah was made. The presence of becquerelite, carnotite, metazeunerite, phosphuranylite, plus probably uranophane and muscovite is noted. Optical and x-ray diffraction data are given for carnotite, a "zippeite-like" mineral and antlerite from the Delta deposit together with a brief history of antlerite. (auth)

4999

RADON LEAKAGE FROM RADIOACTIVE MINERALS. Bruno J. Giletti and J. Laurence Kulp (Lamont Geological Observatory, Palisades, N. Y.). Am. Mineralogist 40, 481-96(1955) May-June.

The leakage of radon from a variety of primary and secondary uranium minerals has been measured. At room temperature pitchblende specimens show radon loss ranging from 0.064 to 16.6%; uraninite, 0.58 to 0.80%; samarskite, approximately 0.03%; carnotite, 17 to 27%; and zicron, 1.6 to 6.2%. These ranges are not maximal since only a few specimens at each type were measured, but they indicate the order of magnitude involved. Radon leakage increases with temperature such that at 150°C. it is about twice that at room temperature. Between 200 and 300°C. recrystallization ensues, reducing the internal surface area and the radon leakage. Measurements were made under equilibrium and nonequilibrium conditions. These studies helped define the mechanism of radon leakage as one of gaseous diffusion through the microfissures of the mineral. Application of a radon leakage correction to Pb^{206}/U^{238} ages of certain minerals brings them essentially into agreement with the Pb^{207}/U^{235} ages. (auth)

5000

EXCHANGE OF OXYGEN BETWEEN CALCIUM CARBONATE AND WATER IN RELATION TO THE PROBLEMS OF THE "GEOLOGICAL THERMOMETER." A. I. Brodskii and V. A. Lunenok-Burmakina (Pisarzhevskii Inst. of Physical Chemistry). Doklady Akad. Nauk S.S.S.R. 101, 715-17(1955) Apr. 1. (In Russian)

5001

PROGRESS IN RADIOACTIVE IRON OXIDES INVESTIGATIONS. Tom G. Lovering. Econ. Geol. 50, 186-95(1955) Mar.-Apr.

The compilation of data on uranium and thorium deposits in various western states has shown that many of these deposits are closely associated with zones of secondary radioactive iron minerals. A study of these radioactive "limonites" was therefore undertaken in an attempt to find out in what form the radioactive material is present in the limonite, how it was introduced, and whether a field study of leached ferruginous cappings over uranium and thorium deposits might yield information about the depth, distribution, size, and grade of underlying ore bodies. This investigation consisted largely of a detailed study and analysis of many samples generously contributed by others—samples containing from 0.001 to 0.7% uranium, from 0.003 to 5.3% equivalent uranium, and from 0.001 to 4.16 % ThO$_2$. It is concluded that uranium minerals in an oxidizing sulfide environment go into solution in acid sulfate waters as uranyl sulfate in the presence of ferric sulfate. When these acid waters are neutralized, ferric sulfate hydrolyzes to form colloidal ferric oxide hydrate. This adsorbs the uranyl ion and thus removes most of the uranium from solution. As the colloidal ferric oxide hydrate ages, it crystallizes to form goethite and in this process most of the uranium is expelled to form particles of secondary uranium minerals in the resulting limonite. Most thorium minerals are resistant to weathering and remain in their original form in thorian limonites. (auth)

5002

GEOCHEMISTRY AND MINERALOGY OF A URANIFEROUS LIGNITE. Irving A. Breger, Maurice Deul, and Samuel Rubinstein. Econ. Geol. 50, 206-26(1955) Mar.-Apr.

Detailed studies have been carried out on a uraniferous lignite from the Mendenhall strip mine, Harding County, S. Dak. By means of heavy-liquid separations, a mineral-free concentrate of the lignite was obtained that contained 13.8% ash and 0.31% uranium in the ash. The minerals (gypsum 69%, jarosite 10%, quartz 2%, kaolinite and clay minerals 19%, and calcite trace) contain only 7% of the uranium in the original coal, indicating an association of the uranium with the organic components of the lignite. Batch extractions show that 88.5% of the uranium can be extracted from the lignite by two consecutive treatments with boiling 1N hydrochloric acid. Continuous extraction with hot 6 N hydrochloric acid removes 98.6% of the uranium. Columns of coal were treated with water, 1 N hydrochloric acid, 6 N hydrochloric acid, and a solution of lanthanum nitrate. The experiment with lanthanum nitrate indicated that only 1.2% of the uranium in the coal is held by ion exchange. The elutriation experiments showed that the uranium is held in the coal as an organo-uranium compound or complex that is soluble at a pH of less than 2.18. A geochemical mechanism by which the uranium may have been introduced into and retained by the lignite is discussed. (auth)

5003

BIOGEOCHEMICAL RECONNAISSANCE OF THE ANNIE LAURIE URANIUM PROSPECT, SANTA CRUZ COUNTY, ARIZONA. Roger Y. Anderson and Edwin B. Kurtz, Jr. (Univ. of Arizona, Tucson). Econ. Geol. 50, 227-32(1955) Mar.-Apr.

A survey of the radioactivity of the vegetation growing on a uranium deposit near Ruby, Arizona, was made in the summer of 1954. The plant ash was analyzed for radioactivity by the alpha scintillation method. The uranium occurs as a zone of irregular pitchblende mineralization in a highly fractured rhyolite porphyry that overlies a series of sandstones, limestones, and shales. The radioactivity of the plants growing over the rhyolite porphyry was twice that of the plants growing over the sedimentary sequence, and plants growing in the zone of pitchblende mineralization were very radioactive. The plant analyses detected another possible pitchblende zone outside the known zone. At the Annie Laurie deposit the method provides an estimate of the amount of uranium mineralization to depths of about 20 feet, depending upon the species used. (auth)

5004

PHOTOGEOLOGIC MAP OF THE ELK RIDGE-2 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-7. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5005

PHOTOGEOLOGIC MAP OF THE ORANGE CLIFFS-16 QUADRANGLE, SAN JUAN AND GARFIELD COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-16. J. N. Platt. Washington, U. S. Geological Survey, 1955. $0.50.

5006

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-4 QUAD-

RANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-20. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5007

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-9 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-25. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5008

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-10 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-26. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5009

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-11 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-27. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5010

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-13 QUADRANGLE, GARFIELD AND KANE COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-28. B. H. Kent. Washington, U. S. Geological Survey, 1955. $0.50.

5011

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-14 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-29. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5012

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-15 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-30. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50

5013

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-16 QUADRANGLE, GARFIELD AND KANE COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-31. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5014

PHOTOGEOLOGIC MAP OF THE ELK RIDGE-7 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-32. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5015

PHOTOGEOLOGIC MAP OF THE WHITE CANYON-1 QUADRANGLE, SAN JUAN AND GARFIELD COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-33. J. C. Reed, Jr. Washington, U. S. Geological Survey, 1955. $0.50.

5016

PHOTOGEOLOGIC MAP OF THE NOTOM-15 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP 1-34. R. J. Hackman and G. E. Tolbert. Washington, U. S. Geological Survey, 1955. $0.50.

5017

PHOTOGEOLOGIC MAP OF THE ELK RIDGE-15 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-35. H. S. Bennett. Washington, U. S. Geological Survey, 1955. $0.50.

5018

PHOTOGEOLOGIC MAP OF THE WHITE CANYON-2 QUADRANGLE, SAN JUAN AND GARFIELD COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-36. J. C. Reed, Jr. Washington, U. S. Geological Survey, 1955. $0.50.

5019

PHOTOGEOLOGIC MAP OF THE STRAIGHT CLIFFS-2 QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-37. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5020

PHOTOGEOLOGIC MAP OF THE STRAIGHT CLIFFS-9 QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-38. J. C. Reed, Jr. Washington, U. S. Geological Survey, 1955. $0.50.

5021

PHOTOGEOLOGIC MAP OF THE STRAIGHT CLIFFS-7 QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-39. B. H. Kent. Washington, U. S. Geological Survey, 1955. $0.50.

5022

PHOTOGEOLOGIC MAP OF THE STRAIGHT CLIFFS-1 QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP. I-40. V. H. Sable. Washington, U. S. Geological Survey, 1955. $0.50.

5023

PHOTOGEOLOGIC MAP OF THE NAVAJO MOUNTAIN-6 QUADRANGLE, KANE AND SAN JUAN COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-41. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5024

PHOTOGEOLOGIC MAP OF THE NAVAJO MOUNTAIN-3 QUADRANGLE, KANE AND SAN JUAN COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-42. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5025

PHOTOGEOLOGIC MAP OF THE NAVAJO MOUNTAIN-4 QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-43. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5026

PHOTOGEOLOGIC MAP OF THE NAVAJO MOUNTAIN-5 QUADRANGLE, KANE AND SAN JUAN COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-44. H. S. Bennett. Washington, U. S. Geological Survey, 1955. $0.50.

5027

PHOTOGEOLOGIC MAP OF THE NAVAJO MOUNTAIN-12 QUADRANGLE, KANE AND SAN JUAN COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-45. H. S. Bennett. Washington, U. S. Geological Survey, 1955. $0.50.

5028

PHOTOGEOLOGIC MAP OF THE MT. PENNELL-5 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-46. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5029

PHOTOGEOLOGIC MAP OF THE MT. PENNELL-11 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS

GEOLOGIC INVESTIGATIONS MAP I-47. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5030

PHOTOGEOLOGIC MAP OF THE MT. PENNELL-12 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-48. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5031

PHOTOGEOLOGIC MAP OF THE MT. PENNELL-13 QUADRANGLE, GARFIELD AND KANE COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-49. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5032

PHOTOGEOLOGIC MAP OF THE MT. PENNELL-14 QUADRANGLE, GARFIELD AND KANE COUNTIES, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-50. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5033

PHOTOGEOLOGIC MAP OF THE CLAY HILLS-1 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-51. C. H. Marshall. Washington, U. S. Geological Survey, 1955. $0.50.

5034

PHOTOGEOLOGIC MAP OF THE CIRCLE CLIFFS-12 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-52. R. J. Hackman. Washington, U. S. Geological Survey, 1955. $0.50.

5035

PHOTOGEOLOGIC MAP OF THE BLUFF-6 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-53. P. P. Orkild. Washington, U. S. Geological Survey, 1955. $0.50.

5036

PHOTOGEOLOGIC MAP OF THE BLUFF-11 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-54. C. F. Miller. Washington, U. S. Geological Survey, 1955. $0.50.

5037

PHOTOGEOLOGIC MAP OF THE ELK RIDGE-10 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-55. H. S. Bennett. Washington, U. S. Geological Survey, 1955. $0.50.

5038

PHOTOGEOLOGIC MAP OF THE ELK RIDGE-11 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-56. J. C. Reed, Jr. Washington, U. S. Geological Survey, 1955. $0.50.

5039

PHOTOGEOLOGIC MAP OF THE MOAB-5 QUADRANGLE, GRAND COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-57. J. S. Detterman. Washington, U. S. Geological Survey, 1955. $0.50.

5040

PHOTOGEOLOGIC MAP OF THE CLAY HILLS-8 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-58. C. H. Marshall. Washington, U. S. Geological Survey, 1955. $0.50.

5041

PHOTOGEOLOGIC MAP OF THE BLUFF-5 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-60. P. P. Orkild. Washington, U. S. Geological Survey, 1955. $0.50.

5042

PHOTOGEOLOGIC MAP OF THE BLUFF-8 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-61. C. F. Miller. Washington, U. S. Geological Survey, 1955. $0.50.

5043

PHOTOGEOLOGIC MAP OF THE CLAY HILLS-7 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-62. C. H. Marshall. Washington, U. S. Geological Survey, 1955. $0.50.

5044

AIRBORNE RADIOACTIVITY SURVEY OF PART OF MOFFAT COUNTY, COLORADO SOUTH OF 40° 45′. GEOPHYSICAL INVESTIGATIONS MAP GP 126. R. W. Johnson. Washington, U. S. Geological Survey 1955. $0.50.

5045

AIRBORNE RADIOACTIVITY SURVEY OF PART OF MOFFAT COUNTY, COLORADO NORTH OF 40° 45′. GEOPHYSICAL INVESTIGATIONS MAP GP 125. R. W. Johnson. Washington, U. S. Geological Survey, 1955. $0.50.

5046

AIRBORNE RADIOACTIVITY SURVEY OF THE MYTON AREA, DUCHESNE AND UINTAH COUNTIES, UTAH. GEOPHYSICAL INVESTIGATIONS MAP GP 127. R. W. Johnson. Washington, U. S. Geological Survey, 1955. $0.50.

5047

PRELIMINARY GEOCHEMICAL STUDIES IN THE CAPITOL REEF AREA, WAYNE COUNTY, UTAH. Lyman C. Huff. U. S. Geol. Survey Bull. 1015-H, 1955. pp.247-56. $0.15 (GPO).

A bleached zone at the base of the Chinle formation near the Oyler mine, Wayne County, Utah, was studied to establish whether there was a chemical relationship between bleaching in the Chinle and uranium mineralization in the Shinarump conglomerate. The preliminary results suggest that the bleaching was accomplished by a slightly reducing acid solution which deposited zinc and copper but no uranium in the bleached zone. A field test for heavy metals which has been devised for geochemical prospecting appears to be satisfactory for detecting and tracing such mineralization effects. It is hypothesized that the solution which bleached the Chinle also deposited uranium in the Shinarump, but more work is needed to clarify this relationship. (auth)

5048

PHYSICAL STRATIGRAPHY OF THE PHOSPHORIA FORMATION IN PART OF SOUTHWESTERN MONTANA. Earle R. Cressman. U. S. Geol. Survey Bull. 1027-A, 1-31(1955). $0.55 (GPO).

In much of southwestern Montana the Phosphoria formation of Permian age has been divided by previous workers into five units, tentatively designated as units A to E in ascending order. Unit A consists of dolomite and quartz sandstone. It is underlain by the Quadrant formation of Pennsylvanian age. Unit B consists of phosphate rock and carbonaceous mudstone. Immediately west of Lima, Mont., the unit is 30 feet thick, but 70 miles to the north and east it disappears. A few miles east of Lima unit C is nearly 300 feet thick, but it thins to the east, north, and west. Near Lima bedded chert constitutes the lower third and dolomite the upper two-thirds of the unit. The dolomite grades westward into dolimitic sandstone, and both chert and dolomite thin eastward as sand becomes more prominent. Unit D consists of phosphate rock and carbonaceous mudstone. Near Lima the unit thins from 80 feet to 5 feet or less in the Gravelly and Madison Ranges. Unit E, which consists largely of sandstone and bedded chert, is 100 to 130 feet thick over much of the area. Facies changes between chert and sandstone are common and abrupt. The chert, in part, intertongues with or grades into mudstone on the extreme west and south parts of the region discussed. Facies changes occur within units, but in most of the area there is little lateral gradation between units. Sand was derived from both east and west, and the silt and clay may have had a western source. Facies changes from sandstone to chert are thought to have resulted from the sorting of siliceous organic remains from detrital quartz sand. (auth)

5049

GUIDEBOOK TO THE GEOLOGY OF UTAH, NUMBER 9, URANIUM DEPOSITS AND GENERAL GEOLOGY OF SOUTHEASTERN UTAH. William Lee Stokes, ed. Salt Lake City, Utah Geological and Mineralogical Survey, 1954. 115p., 18 figs., 5 plates, and 2 tables. $3.00.

This up-to-date guidebook to the geology and uranium deposits of the Thompson district (Grand Co.) and Big Indian-Lisbon Valley area (San Juan Co.) in southwestern Utah is divided into the following chapters: history of radium-uranium mining in the Plateau Province (R. Clare Coffin); summary of events in the Colorado Plateau since 1924 (anonymous); stratigraphy of the southeastern Utah uranium region (Wm. Lee Stokes); structural features of southeastern Utah and adjacent parts of Colorado, New Mexico, and Arizona (Eugene M. Shoemaker); the uranium mineralogy of the Colorado Plateau and adjacent regions (John W. Gruner); geology and uranium deposits of the Thompson area, Grand County, Utah (Wm. Lee Stokes and C. M. Mobley); ore deposits of the Big Indian Wash-Lisbon Valley area (Y. Wm. Isachsen); side trip to Arches National Monument (U. S. Park Service); and itinerary and road logs. With the wealth of detailed information it contains, this guidebook should prove invaluable to geologists and prospectors working in this and adjacent regions. Mineralogists will be particularly interested in Gruner's discussion of the mineralogical relations between the oxidized and unoxidized uranium ores. (J.E.D.)

METALS AND METALLURGY

5050 AD-36906-A

Dow Chemical Co. Metallurgical Labs., Midland, Mich.
QUARTERLY REPORT NO. 7 FOR THE PERIOD OBTOBER 1, 1953 TO DECEMBER 31, 1953. PHASE II. PRINCIPLES OF THE EFFECT OF RARE EARTH ADDITIONS ON THE HIGH TEMPERATURE PROPERTIES OF MAGNESIUM. REPORT 15657. 27p. Contract AF 33(038)-16655.

A 6.2 percent aluminum alloy in the solution heat-treated and aged condition has been creep tested at 300, 400, 500, and 600°F. In addition to the observations of deformation mechanisms on specimen surfaces polished before testing, the progress of precipitation during testing was studied by polishing and etching specimens after it. Creep strain exerted a significant influence on the kinetics of precipitation even to the point of forcing its operation at 600°F where solution occurs in the unstrained condition. High creep rates favor discontinuous precipitation at the expense of the continuous type. The preferred orientation of this alloy was favorable for twinning. The operation of this process correlated once again with a large primary stage at 300°F. Solid solubility data for thorium in magnesium over the range 900 to 1080°F have been obtained. When combined with previous solidus and eutectic determinations, they indicate a maximum solid solubility of about 6 to 7 percent at approximately 1100°F. (auth)

5051 AD-36906-B

Dow Chemical Co. Metallurgical Labs., Midland, Mich.
QUARTERLY REPORT NO. 7 FOR THE PERIOD OCTOBER 1, 1953 TO DECEMBER 1, 1954. PHASE III. A FUNDAMENTAL STUDY OF NATURAL AND SYNTHETIC FILMS ON MAGNESIUM AND ITS ALLOYS. REPORT 15719. 44p. Contract AF 33(038)-16655.

The microstructures of the corrosion films formed on magnesium as a result of exposure to $NaCl-Na_2CrO_4$ aqueous systems have been studied. The polarization behavior of magnesium and magnesium alloys in salt-chromate solutions was determined. A hypothesis was advanced to explain the delay effect. (C.W.H.)

5052 NP-5642

Tennessee. Univ., Knoxville.
THE WETTING CHARACTERISTICS OF MERCURY ON COPPER AND SILVER. Braxton W. Cross and Richard E. Pawel. Jan. 1953. 57p.

Special project report submitted as thesis.

The wetting properties Hg on pure Cu and Ag were investigated qualitatively by visually noting the wetting procedures exhibited by the different specimens and quantitatively by measuring the values of the contact angle of drops resting on horizontal surfaces. By combining the results of the two methods, an attempt was made to establish the significance of the contact angle with respect to wetting of this type. Two different kinds of wetting phenomena, physical wetting and diffusional wetting, are defined and the contribution of each is discussed. (C.H.)

5053 NP-5653

Western Reserve Univ., Cleveland. Ultrasonics Research Lab.
THE EFFECT OF ULTRASONIC WAVES ON THE ELECTRODEPOSITION OF NICKEL. TECHNICAL REPORT NO. 15. Robert Penn, Ernest Yeager, and Frank Hovorka. Apr. 1, 1955. 47p. Contract N7onr-47002.

The effects of ultrasonic waves at 800 kc have been studied in terms of the electrodeposition of nickel from sulfate solutions. The simultaneous discharge of both nickel and hydrogen ions is involved. Appreciable effects have been found only when cavitation occurs. The polarization associated with the deposition processes is decreased to a considerable extent. The efficiency for the deposition of nickel may be either decreased or increased depending on the hydrogen ion and nickel ion concentrations in the solution as well as the current density. Similar effects to a much lesser extent can be produced by vigorous stirring of the electrolytic solution. X-ray diffraction studies of the deposits indicate that the ultrasonic waves decrease the tendency for the 110 planes of the face centered cubic system to be oriented parallel to the electrode surface at high current densities and increase the tendency for the 100 planes to be oriented parallel to the surface at low current densities. (auth)

5054 NP-5655

Columbia Univ., New York. School of Engineering.
INTERNAL FRICTION OF METAL SINGLE CRYSTALS.

FINAL REPORT. [1954?]. 107p. Contract DA-30-069-ORD-459.

The effect of annealing on the internal friction of Cu and Al single crystals is reported. The effects of x irradiation on the internal friction of NaCl single crystals were studied. Internal fraction measurements were made on plastically deformed single crystals of Al, Ag, NaCl, and Cu. (L.T.W.)

5055 NP-5656
California Inst. of Tech., Pasadena. Physical Metallurgy Lab.
A STUDY OF ELECTRON EFFECTS IN SOLID SOLUTION ALLOYS OF TITANIUM. Joseph M. Denney. Jan. 1955. 161p. Contract N6onr-24430, Technical Report No. 6.

The preparation and measurement of lattice parameter, resistivity, magnetic susceptibility, Hall coefficient, and coefficient of magneto-resistance of titanium alloys with solutes of Al, Ag, and Ga are described. Differences in physical properties of the alloys led to the conclusions that titanium is antiferromagnetic and has an alloying valence of approximately 2 electrons per atom. (C.W.H.)

5056 NP-5660
Columbia Univ., New York. School of Engineering.
DEPARTMENT OF INDUSTRIAL ENGINEERING STATISTICAL ESTIMATION OF THE ENDURANCE LIMIT. TECHNICAL REPORT T-3A. E. J. Gumbel. Apr. 1, 1955. 40p. Contract DA-30-069-ORD-1061. (CU-3-55-ORD-1061-IE).

The endurance limit is defined as the greatest stress for which the probability of surviving an infinite number of cycles is one. An expression is derived for the general survivorship function for fatigue failures and estimates are made of the endurance limit and the probability of permanent survival. A statistical interpretation is made of fatigue data previously obtained for steel. (C.W.H.)

5057 NP-5672
Utah. Univ., Salt Lake City. Inst. for the Study of Rate Processes.
THE ENGINEERING APPLICATION OF THE ABSOLUTE RATE THEORY TO THE CREEP OF CAST MAGNESIUM. TECHNICAL REPORT NO. XLVII. Mervin B. Hogan. Apr. 1, 1955. 47p. Contract N7-onr-45101.

The results of the analysis of various experimental data pertaining to the creep of several cast magnesium alloys are reported. These data were analyzed in terms of a four-element mechanical model as an analog, in conjunction with the absolute rate theory. Tables were compiled of the calculated magnitudes of the several parameters and related quantities. Mean values of all these results were ascertained and included in the tables. The degree of agreement between the theory and the data leads to the conclusion that the absolute rate theory is a most useful concept for engineering application to the creep of solids. (auth)

5058 SO-2520
General Electric Co. Research Lab., Schenectady, N. Y.
DEVELOPMENT OF ZIRCONIUM-BASE ALLOYS. TWENTY-SECOND QUARTERLY REPORT. (PROGRESS REPORT NO. 23). J. H. Keeler. Apr. 5, 1955. 17p. Contract W-31-109-Eng-52. (RL-1303)

The stress-rupture characteristics of β-annealed Zr are essentially equivalent to those of α-annealed Zr at room temperature and 300°C. However, at 500°C, the minimum creep rate is less and the rupture life is greater than for α-annealed Zr. The 1400°C annealing texture of a metastable body-centered-cubic Zr alloy sheet containing 18% Nb was (111) <112>. The Burgers orientation relation was found applicable to this alloy when transformed to the hexagonal-close-packed phase. The tensile properties of Zr-Ta and Zr-Nb binary alloys are summarized. (For preceding period see SO-2519.) (auth)

5059 TAM-83
Illinois. Univ., Urbana.
INVESTIGATION OF THE BEHAVIOR OF OVERSTRAINED THICK-WALLED CYLINDERS. TECHNICAL REPORT NO. 3. THE OVERSTRAINING OF MEDIUM-CARBON STEEL THICK-WALLED CYLINDERS. M. C. Steele and L. C. Eichberger. Apr. 1955. 78p. Contract DA-11-022-ORD-1527.

Experimental results are presented on the behavior of four medium-carbon steel cylinders (6 in. OD × 3 in. ID × 8 in. long) overstrained by internal pressure. Particular attention is given to the mechanism of yielding and the associated strains measured at various locations on the bore and outside surfaces. The yield mechanism consists of the propagation through the cylinder walls of a finite number of Lueders' lines. Initiation of yield requires a maximum shear stress higher than that found from the lower yield in a tension test. Lueders' line patterns are asymmetrical but follow closely the maximum shear stress trajectories. Creep of slow yielding is a feature of the mechanism. Full yield in the cylinders is accompanied by an increase in the number and width of Lueders' lines and corresponding increases in circumferential strains. The nonhomogeneous mechanism of yielding is reflected by variations in strain circumferentially. Average bore and outside diameter circumferential strains compare favorably with theories due to Thomas and Koiter. Axial strains are essentially elastic in keeping with Koiter but in marked disagreement with Thomas. Circumferential strains exhibit significant creep. A comparison is given between the Lueders' line patterns in mild steel and medium-carbon steel cylinders. (For preceding report in series see TAM-79.) (auth)

5060 TAM-84
Illinois. Univ., Urbana.
THE BEHAVIOR OF MATERIALS UNDER REPEATED STRESS. TECHNICAL REPORT NO. 42. SHAPE AS A FACTOR IN FLEXURAL FATIGUE STRENGTH. H. T. Corten and T. J. Dolan. May 1955. 25p. Contract N6ori-071(04).

The influence of "shape of cross section" on the fatigue strength of 24S-T aluminum alloy was investigated. Previous work indicated that (a) a large amount of material exposed to peak stress and (b) exposed sharp edges were two major factors that contributed to a reduction of fatigue strength. Five cross-sections including circular, square, modified square (rounded edges), diamond and modified diamond (rounded edges) were investigated. From 6 to 12 specimens of each cross-section were tested and the data were analyzed by averaging over the range of lifetimes obtained to increase the reliability of the results. The influence of the two "shape" effects on fatigue strength were separated. It was found that sharp edges decreased the fatigue strength approximately 10 per cent as compared to $^1/_8$ inch radius rounded edges and the fatigue strength decreased approximately as the logarithm of the area of material exposed to peak stress. (auth)

5061 WADC-TR-52-307(Pt.1)
Minnesota. Univ., Minneapolis.
FATIGUE PROPERTIES OF ALUMINUM ALLOYS AT VARIOUS DIRECT STRESS RATIOS. PART I. ROLLED ALLOYS. B. J. Lazan and A. A. Baltherwick. Dec. 1952. 84p. Contract AF 33(038)-20840. (AD-7610)

Newly developed equipment for axial stress fatigue testing in the tension-compression range is described. Fatigue data on 14S-T6, 24S-T4, and 75S-T6 aluminum alloys are presented as S–N curves and stress range diagrams to illustrate and analyze the effects of: (a) stress ratios in the range from static tension to reversed axial stress, (b) stress magnitude which causes failure in the range from 10^3 to 10^7 cycles, and (c) severity of circumferential notches having four different theoretical stress concentration factors in the range between 1.0 and 3.4. The extreme flatness of the stress range diagrams for severely notched specimens at long life is discussed in terms of the large reduction in mean load carrying capacity resulting from the addition of relatively small alternating stress. Unitless stress range diagrams are presented which indicate how material, life, and specimen type effect the combinations of alternating and mean stress which cause failure in a specified number of cycles. Data on the reduction in fatigue strength caused by notches are diagrammed to clarify the significance of mean stress, alternating stress, stress ratio, and cycles to failure as factors in fatigue notch sensitivity. The fatigue properties determined in this program are compared with prior work. The low fatigue strengths observed for 75S-T6 are briefly discussed. (auth)

5062 WADC-TR-53-336(Pt.3)
California. Univ., Berkeley.
[DESIGN AND EVALUATION DATA FOR STRUCTURAL METALS]. THE CREEP PROPERTIES OF METALS UNDER INTERMITTENT STRESSING AND HEATING CONDITIONS. PART 3. COMBINED INTERMITTENT STRESSING AND HEATING. Lawrence A. Shepard, C. Dean Starr, Carl D. Wiseman, and John E. Dorn. July 1954. 24p. Contract AF 33(038)-11502. (AD-49029).

Tests on the combined effect of intermittent loading and intermittent heating on the creep strength of aluminum alloy 75S-T6 at 450°F were performed. Results are summarized. (auth)

5063 WADC-TR-54-398
Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS MADE BY POWDER-METALLURGY TECHNIQUES. W. L. Bruckart, C. M. Craighead, and R. I. Jaffee. Jan. 1955. 176p. Contract AF33(038)-12641.

Studies were made of molybdenum and of molybdenum-base binary and ternary alloys prepared by powder-metallurgy techniques; hydrogen sintering was used. An evaluation was made also of molybdenum and binary molybdenum alloys prepared by vacuum sintering. In the foregoing programs, the following addition elements were studied: Al, B, Be, C, Nb, Co, Cr, Fe, In, Mn, Ni, P, S, Si, Sn, Ta, Th, Ti, V, W, and Zr. The evaluation of the alloys made with these elements included investigations of room-temperature strength, hardness, bend ductility, hot hardness, creep characteristics, and resistance to recrystallization. During this investigation, a new type of molybdenum-base composition was developed. The composition consisted of dispersions of very fine particles of oxides in molybdenum. The following oxides were studied as additions to molybdenum: Al_2O_3, BaO, CaO, CeO_2, Cr_2O_3, MgO, SiO, SrO, ThO_2, TiO_2, and ZrO_2. Evaluation was on the same basis as for the standard molybdenum-base alloys. Additional studies conducted during the investigation included a determination of room-temperature fatigue of notched and unnotched molybdenum, and a preliminary experiment to test the practicality of cladding molybdenum with nickel by hammer forging. (auth)

5064 WADC-TR-54-404
Cornell Aeronautical Lab., Inc., Buffalo.
[TITANIUM AND METAL ALLOYS]. EVALUATION OF TITANIUM AIRCRAFT PARTS; SEMI-FINISHED PRODUCTS. F. J. Gillig and L. W. Smith. Aug. 1954. 73p. Contract AF 33(616)-471.

Results of a correspondence survey taken of several commercial producers of aircraft engines and aircraft on various problems encountered in the fabrication and processing of titanium and titanium alloys are presented. Problems which were surveyed included mechanical property variance in unalloyed and alloyed titanium sheet, fatigue of forged titanium, and stress relief procedures. (C.W.H.)

5065 WADC-TR-54-490
Aeroprojects, Inc., West Chester, Penna.
[METALLIC MATERIALS; ALUMINUM ALLOYS]. THE EFFECT OF ULTRASONICS ON MOLTEN METALS. J. Byron Jones, John G. Thomas, and Carmine F. DePrisco. Jan. 1955. 126p. Contract AF33(616)-2050.

The application of ultrasonics at a frequency of about 15 kc to small melts of 195 aluminum alloy resulted in accelerated degassing. Grain refinement was observed only when ultrasonic energy was introduced at or above the liquidus temperature. A microphone to appraise elastic energy levels in liquid melts was devised. Extensive investigations of the problems incident to the transmission of elastic vibratory energy into the molten metals were carried out, and the requirements therefore are reported. (auth)

5066 WADC-TR-55-213
Wall Colmonoy Corp. Research Lab., Detroit
[BRAZING ALLOY DEVELOPMENT]. DEVELOPMENT OF BRAZING ALLOYS FOR JOINING HEAT RESISTANT ALLOYS. Forbes M. Miller, Homer S. Gonser, and Robert L. Peaslee. Mar. 1955. 70p. Contract AF 33(616)-2287.

Fifteen different alloy systems were tested and studied for brazing characteristics and chemical and physical properties. These alloys were nickel-base binary and ternary systems containing such metals and metalloids as phosphorus, silicon, chromium, manganese, molybdenum, tungsten, and iron. The nickel-phosphorus-chromium system and nickel-phosphorus-silicon system showed the best properties of the phosphorus-bearing alloys. The nickel-silicon-manganese system showed the best properties of the silicon-bearing alloys. Of the alloys studied the silicon-bearing alloys in general are higher melting than the phosphorus-bearing alloys. Studies also showed that phosphorus and manganese contributed the most toward improving the flow and wetting properties of the alloys, while silicon and chromium contributed the most toward improving the oxidation resistance and strength properties of the alloys. (auth)

5067 AEC-tr-2149
ON THE DETERMINATION OF THE COEFFICIENT OF SELF-DIFFUSION OF IRON IN AN ALLOY OF AUSTENITE.

M. A. Krishtal. Translated by S. J. Rothman from Zhur. Tekh. Fiz. 25, 144-8(1955). 8p.

A new method of determining the coefficient of self-diffusion of iron in Austenite, based on the determination of the speed of the process of decarburization of graphitized pig iron. With the help of the method the dependence of the coefficient of self-diffusion of iron on the Si and Ni contents and on the temperature was determined in Fe-C-Si and Fe-C-Ni alloys. The results obtained are found to be in accordance with the hypothesis about relay mechanism of self-diffusion in iron. The self-diffusion of atoms of iron plays a significant role in a series of such technically important processes as the graphitization of pig iron and steel, the coalescence of graphite, and the covering of graphite pores during the decarburization of graphitized cast irons. The process of self-diffusion is important in powder metallurgy. (auth)

5068 AEC-tr-2157

PRECIPITATION IN PLASTIC DEFORMED MIXED CRYSTALS. Hermann Schumann. Translated from Metallurgie u. Giessereitech. 4, 474-85(1954). 42p.

5069

RECRYSTALLIZATION DIAGRAM OF IODIDE TITANIUM. E. M. Savitskii, M. A. Tylkina, and A. N. Turanskaya (Baikov Inst. of Metallurgy). Doklady Akad. Nauk S.S.S.R. 101, 857-9(1955) Apr. 11. (In Russian)

5070

INTERMEDIATE PHASES IN THE Cr–Mo–Co SYSTEM AT 1300°C. J. B. Darby, Jr. and P. A. Beck (Univ. of Illinois, Urbana). J. Metals 7, 765-6(1955) June.

It was found that at 1300°C a continuous field of solid solutions connects the (Cr,Co)σ with the (Co,Mo)σ in the Cr–Mo–Co ternary system. The ternary σ phase field is considerably wider than either one of the binaries. A new ternary phase, D, of unknown and apparently complex crystal structure was found at 1300°C at the approximate composition occupied at 1200°C by the R phase. (auth)

5071

SURFACE PROTECTION OF TITANIUM AND STAINLESS STEEL DURING HEAT TREATMENT. Horace Drever (Drever Co., Bethayres, Penna.). Metal Progr. 67, No. 6 87-90(1955) June.

Vacuum furnaces have proved successful in preventing embrittlement of Ti during annealing. Extremely dry H was used successfully in both bright hardening and bright annealing of stainless steels. (auth)

5072

ELECTRICAL RESISTANCE OF COPPER–GOLD ALLOYS AT LOW TEMPERATURES. Elio Passaglia and William F. Love (Univ. of Pennsylvania, Philadelphia). Phys. Rev. 98, 1006-10(1955) May 15.

The resistance of copper–gold alloys of composition 25, 37.5, 50, 62.5, and 75 atomic percent gold has been measured as a function of temperature from room temperature to 2°K in states slowly cooled and rapidly quenched from above the ordering temperatures. The room-temperature resistivities agree with those previously obtained by Johanssen and Linde. The residual resistances are high in both the quenched and slowly cooled states, but the ratio of residual resistance to the ice point resistance was found to be appreciably lower in the slowly cooled states for the 25 and 50 atomic percent gold composition. The other compositions showed no such difference in the residual resistance ratio for the quenched and annealed states. Values of Debye temperature calculated by means of the Grüneisen function were found to be strongly temperature dependent, and no appreciable difference was found in the Debye temperatures of the quenched and slowly cooled states. The Debye temperatures at 75°K were found to obey the equation: $1/\theta_{AB}^3 = x/\theta_A^3 + (1-x)/\theta_B^3$. Hysteresis anomalies of the order of 1 percent were found in the neighborhood of 225°K. (auth)

5073

THE PREPARATION OF TITANIUM CARBIDE SPECIMENS FOR MICROSCOPIC STUDY. Ronald Silverman and Patricia Doshna Luscz (American Electro Metal Corporation, Yonkers, N. Y.). Powder Met. Bull. 7, 25-8(1954) Dec.

Results indicate that a fine diamond base grinding and polishing agent is the best used for the preparation of titanium carbide specimens for microscopic examination. The use of the 320 grit resin-bonded diamond cup wheel for grinding followed by polishing on silk cloth impregnated with Hyprez diamond paste gives the required surface readily with a minimum of manual labor. It is estimated that after mounting, the specimen can be ground and polished in ten to fifteen minutes. (auth)

PHYSICS

5074 AD-18569

Fairchild Camera and Instrument Corp. Potentiometer Div., Hicksville, N. Y.

HERMETICALLY SEALED, HIGH TEMPERATURE VARIABLE FILM TYPE RESISTOR. REPORT NO. 1074. FINAL PROGRESS REPORT [FOR] APRIL 27, 1950 TO APRIL 27, 1953. Lawrence B. Krauss and Irving G. Patterson. 57p. Contract DA-36-039-sc-77.

A program to develop metallic film potentiometers is described. Polished glass was chosen as the best substrate for evaporated resistance films. Nichrome resistance control films were successfully deposited in the low-resistivity range. Tapered or nonlinear functions with resistance slope ratios of 9 to 1 were produced. Commutators were found to be impractical. Contact eyes and collector strips were formed with a silver–ceramic paint. (M.P.G.)

5075 AECU-3026

Sandia Corp., Albuquerque, N. Mex.

RELIABILITY OF COMPLEX SYSTEMS. AN APPROACH TO THE SYSTEMATIC ANALYSIS OF CIRCUIT OPERATIONS. R. O. Frantik. [Nov. 8, 1954]. 16p. Contract [AT(29-1)-789].

During the design, development, and evaluation of complex electronic and mechanical systems, especially those of complex guided missile systems, it is important that all possible failures be anticipated and the consequences of the particular failure be predicted. These complex systems present such a multitude of possible modes of failure that it is necessary to have an orderly and complete method of attack. The paper presented describes such a method for the theoretical investigation of all possible combinations of failures and successes. The method described also provides a means by which certain types of malfunctions can be minimized in their effect on the overall system. The method employed is a simplified version of Boolean Algebra employing the binomial expansion as a means for generating an expression to guide the analyst in his examination of a complex circuit or mechanism. (auth)

5076 AECU-3027
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
DETECTION OF AIR-BORNE BERYLLIUM DUST. MONTHLY REPORTS NO. 1 AND 2 COVERING THE PERIOD FROM MARCH 1 THROUGH APRIL 30, 1955. R. G. McCarty and L. Reiffel. May 10, 1955. 7p. Contract AT(11-1)-364.

Progress is reported in the development of a Be hazard detector having sufficient sensitivity to detect rapidly and accurately air-borne Be dusts in the respiratory retention size range and at concentrations that are physiologically hazardous. Two detection systems were investigated. One depends upon detection and measurement of the neutrons from the $Be^{9}(\alpha,n)C^{12}$ reaction, and the other depends upon the detection of the γ ray emitted by the C^{12} nucleus during transmutation. Either system must function in the presence of a high-intensity γ field from a Po^{210} source. (C.H.)

5077 NP-5668
Carnegie Inst. of Tech., Pittsburgh.
INVESTIGATIONS OF THERMAL AND ELECTRICAL PROPERTIES OF SOLIDS AT VERY LOW TEMPERATURE. FINAL REPORT [FOR] APRIL 15, 1946 TO SEPTEMBER 30, 1954. S. A. Friedberg. 73p. Contract N6ori-47, T. O. 3.

The heat capacities of Cr, Ti, Zr, Cu, $MnNi_3$, Hf, $ZnOFe_2O_3$, $ZnOCr_2O_3$, and α brass have been determined as functions of temperature in the liquid helium range as well as between liquid hydrogen temperatures and about 200°K. The temperature dependence of the resistivity and Hall constant of Ge was determined. The electrical resistance of α brass was measured. A level indicator for low boiling point liquids was developed. (C.W.H.)

5078 NRL-Memo-470
Naval Research Lab., Washington, D. C.
THERMAL AND RELATED PHYSICAL PROPERTIES OF MOLTEN MATERIALS. PROGRESS REPORT NO. 13 [FOR] FEBRUARY 1–APRIL 30, 1955. B. E. Walker and C. T. Ewing. May 20, 1955. 8p.

Measurements of the heat content and the heat capacity of salt "B" over the temperature range 30° to 700°C are reported. (For preceding period see NRL-Memo-454.) (C.W.H.)

5079 UCRL-2992
California. Univ., Berkeley. Radiation Lab.
FREE ENERGY FUNCTIONS OF THE SOLID AND LIQUID ELEMENTS. Leo Brewer. May 1955. 7p. Contract W-7405-eng-48.

The free-energy functions of the solid and liquid elements at 298, 500, 1000, 1500, and 2000°K are tabulated. Additional heats of sublimation of the elements are listed. (auth)

5080 UCRL-3001
California. Univ., Berkeley. Radiation Lab.
THE POINT EMITTER AS A POSITIVE-ION SOURCE (thesis). Russell Gardner Herron. May 16, 1955. 26p. Contract W-7405-eng-48.

Thesis submitted to Naval Postgraduate School, Monterey Calif.

A needle-shaped tungsten "point" filament has been used as a positive ion source. Hydrogen ions were produced experimentally at room temperature from the point emitter under the effect of high electric fields. The electron field-emission microscope is recommended as a tool to augment data on adsorption, migration, and vaporization characteristics of the heavier elements. The preferential transfer of Cm^{242} as ions from an emitter point at 1600°K was observed. The point emitter is shown to be a source of positive ions for solid samples. Application of point-emitter techniques to mass spectroscopy is considered probable upon solution of the sample-replenishment problem. (auth)

5081 AEC-tr-2153
MEASUREMENT OF THE THERMOMECHANICAL EFFECT IN HELIUM II AT ABOUT 1° K. V. P. Peshkov. Translated from Zhur. Eksptl'. i Teoret. Fiz. 27, 351-4(1954). 7p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-665.

5082 AEC-tr-2154
SOME PROPERTIES OF He^{3} SOLUTIONS IN He^{4}. III. VAPOR PRESSURE. B. N. Eselson. Translated from Zhur. Eksptl'. i Teoret. Fiz. 26, 744-50(1954). 10p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-243.

5083 AEC-tr-2161
THE EFFECT OF CONTINUOUS EXPOSURE OF DIFFERENT DURATIONS ON THE PROPERTIES OF PHOTOGRAPHIC FILM. A. L. Kartuzhanskiĭ and P. V. Meĭklyar. Translated from Zhur. Eksptl'. i Teoret. Fiz. 21, 532-40 (1951). 9p. Available from Associated Technical Services (Trans. No. 65G5R), East Orange, N. J.

The dependence of the photosensitivity and contrast coefficient of photographic films on the duration of continuous exposure has been studied. The exposure time was varied from 10^{-7} to 10^{5} sec. The investigation was carried out for various spectral regions and for various conditions of development, while using different types of photographic films. (auth)

5084
NUCLEAR MAGNETIC RESONANCE IN CONCENTRATED AQUEOUS ELECTROLYTES. James N. Shoolery (Varian Associates, Palo Alto, Calif.) and Berni J. Alder (Univ. of Calif., Berkeley). J. Chem. Phys. 23, 805-11(1955) May.

The proton magnetic resonance of water has been examined in the presence of various concentrations of different diamagnetic salts. The observed shifts of the resonance frequency relative to that of pure water are interpreted in terms of the breakdown of the hydrogen-bonded structure of water and the ability of the ions to polarize the water molecules. The concentration dependence of the shifts for the multivalent electrolytes indicates cation-anion interactions at higher concentrations. The quite narrow single line observed for all but the Al^{+++}, Be^{++}, and the very concentrated $ZnCl_2$ solutions shows that in most cases the proton exchanges faster than 10^{4} times per second. The magnetic field dependence of the line width in the $AlCl_3$ solution indicates that a rate of exchange of the proton of about 10^{2} times per second is responsible for the broadening, while in the $ZnCl_2$ and $BeCl_2$ solutions the high viscosity appears mainly to be responsible for the increased line width. The fluorine magnetic resonance studied at several concentrations in KF solutions provides further information about the solvent-ion interaction. (auth)

5085
COMPARISON OF THE ENERGY EXCITATIONS IN LIQUID

He^3 AND He^4. O. K. Rice. (Univ of North Carolina, Chapel Hill). Phys. Rev. 98, 847-51(1955) May 15.

In both He^3 and He^4 there are two types of excitation, a Debye type involving large numbers of molecules, and a localized type of excitation. The latter type is considered in this paper. In the case of He^3 the localized excitations of lowest energy can be discussed rather successfully by means of a pair-rotator model, with hindered rotation in a plane. The pair-rotator model breaks down in the case of the next higher group of excited levels; their energy is about right but there are more such levels than would be expected on the pair-rotator model. The reason for this is considered. In the case of He^4 the so-called roton excitations are of much higher energy than the excited levels in He^3, on account of the statistics and also on account of the effect of the higher density on the hindering of the rotation. These effects can be understood with the aid of the pair-rotator model. The model, itself, however, breaks down for these levels, and the nature of the break-down and the probable character of the rotons are discussed. The results are also of interest in connection with mixtures of He^3 and He^4. Some remarks are appended on the possibility of a λ transition in He^3. (auth)

5086

ENTROPY OF RADIATION. Aadne Ore (Univ. of Oslo, Norway). Phys. Rev. 98, 887-8(1955) May 15.

In view of the recent publication of a derivation of the expression for the entropy flux of radiation, in terms of its spectral specific intensity, a brief comparative study of various known methods for obtaining the entropy formula is presented. (auth)

5087

MAGNETIC SUSCEPTIBILITY OF HAFNIUM AND MANGANESE. C. J. Kriessman and T. R. McGuire (Naval Ordnance Lab., White Oak, Md.). Phys. Rev. 98. 936-7(1955) May 15.

The magnetic susceptibility of hafnium, which has been measured from 4.2 to 1670°K, increases with increasing temperature above 77°K. At room temperature, the susceptibility is (0.42 ± 0.01 × 10^{-6} emu/g. The susceptibility of manganese between 77°K and room temperature shows a maximum at 125°K. This can be identified with antiferromagnetism by a correlation with neutron diffraction data. In the temperature region below 77°K the susceptibility increases again quite rapidly. (auth)

5088

PRECISION ELECTRICAL MEASUREMENTS. PROCEEDINGS OF A SYMPOSIUM HELD AT THE NATIONAL PHYSICAL LABORATORY ON NOVEMBER 17, 18, 19, and 20, 1954. London, Her Majesty's Stationery Office, 1955. $6.25.

The proceedings of the precision electrical measurements symposium are divided into five sections: measurement of capacitance and dielectrics; measurement of inductance and magnetics; measurement of power; high-voltage measurements; and high-voltage impulse testing techniques. 26 papers. (C.W.H.)

COSMIC RADIATION

5089 TT-101(Rev.)

THE MASS SPECTRUM OF VARITRONS. (Spectr Mass Varitronov). A. Alikhanian, A. Alikhanov, V. Morozov, G. Muskhelishvili, and A. Khrimian. Translated and revised by G. Belkov from Zhur. Ekspt'. i Teoret. Fiz. 18, 673-702 (1948). 54p.

A mass spectrometer consisting of a large constant magnet and several groups of counters was constructed for the analysis of the mass of particles which constitute the soft and hard components of cosmic rays. The large dispersion of the spectrometer made it possible to establish that the mass spectrum of varitrons consisted of individual discrete lines. It was established that at 3250m above sea level there are present in cosmic rays more than 12 varieties of varitrons of different mass and having both positive and negative charges. The mass of a varitron varies from 100 to 25,000 electron masses. Simultaneously it was shown that varitrons are also a constituent of the hard component of cosmic rays. An analysis of the spectrum of the momenta of the hard component showed that the varitrons, recorded by a spectrometer, arise as a result of the decomposition of heavier varitrons stopped in the air. The presence of fast protons in cosmic rays was proven by direct measurements. From the determination of the positive excess in the spectrum of the hard component it is possible to conclude that the quantity of fast protons in cosmic rays constitutes not less than 7% of the total intensity. (auth)

5090

STABLE PARTICLES WITH MASSES GREATER THAN THAT OF THE PROTON IN COSMIC RADIATION AT AN ELEVATION OF 3250 METERS ABOVE SEA LEVEL. M. I. Daion (Lebedev Physics Inst.). Doklady Akad. Nauk S.S.S.R. 101, 821-3(1955) Apr. 11. (In Russian)

5091

SPATIAL DISTRIBUTION OF NUCLEAR-ACTIVE PARTICLES IN EXTENSIVE ATMOSPHERIC COSMIC RAY SHOWERS. Yu. N. Vavilov, S. I. Nikol'skii, and V. P. Sarantsev (Lebedev Physics Inst.). Zhur. Ekspt'. i Teoret. Fiz. 28, 505-6(1955) Apr. (In Russian)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

5092 AEC-tr-2164

EXCITONS IN IONIC CRYSTALS. I. M. Dykman and S. I. Pekar. Translated from Doklady Akad. Nauk S.S.S.R. 83, 825-9(1952). 7p. Available from Morris D. Friedman ([Trans.] D193579), West Concord, Mass.

A mathematical treatment of excitons and their interactions with vibrating ions is presented to explain the appearance of broad bands at the red end of the natural absorption in crystals. (C.W.H.)

ELECTRICAL DISCHARGE

5093 AEC-tr-2145

THE OSCILLOGRAPHIC METHOD OF STUDYING GASEOUS DISCHARGE BY MEANS OF PROBES. A. M. Bonch-Bruevich. Translated from Doklady Akad. Nauk S.S.S.R. 81, 371-4(1951). 8p.

A simple oscillographic method is described for observing probe characteristics of electric discharge in gases which permits rapid and accurate determination of discharge parameters. (C.H.)

5094 AEC-tr-2160

THERMAL ARCS OF HIGH TEMPERATURES AND LOW OPERATING VOLTAGE. G. Busz and W. Finkelnburg. Translated from Z. Physik 139, 212-25(1954). 13p.

INSTRUMENTS

5095 AD-31842

Dynamic Electronics-New York, Inc., Glendale, N. Y. INVESTIGATION AND STUDY OF A MINIATURE DELAY

LINE. FINAL REPORT [FOR] NOVEMBER 7, 1952 TO FEBRUARY 15, 1954. A. A. Kiriloff. Feb. 15, 1954. 78p. Contract AF30(602)-380.

Studies have been performed to determine design criteria for delay lines having delays of ~1.5 μsec, a maximum length of 1.4 in., a maximum diameter of ⅜ in., and good response for all frequencies up to 10 Mc. The theory of transistors and transistor circuits is discussed. Engineering studies are recommended on transistor and printed circuit delay lines along with distributed and lumped delay lines described in previous reports. (M.P.G.)

5096 AERE-C/M-238

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A TECHNIQUE FOR OBTAINING X-RAY POWDER PHOTOGRAPHS OF COMPOUNDS OF HIGH SPECIFIC ACTIVITY. K. W. Bagnall and R. W. M. D'Eye. Mar. 4, 1955. 4p.

A simple arrangement of standard x-ray equipment and a method of mounting highly active samples is described with special reference to the photographing of polonium compounds. (auth)

5097 NP-5659

Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

CRITERIA FOR DOCILE BEHAVIOR OF FEEDBACK AMPLIFIERS. TECHNICAL REPORT NO. 258. Samuel J. Mason. June 10, 1954. 8p. Contract DA36-039-sc-42607.

Criteria for docile behavior of feedback amplifiers are outlined. A docile amplifier is defined as one that remains stable when connected to any passive network of a specified type. (L.T.W.)

5098

DISTRIBUTED AMPLIFIER USING TUBES WITH SECONDARY EMISSION. Dobrivoje T. Jovanović and Velimir N. Kostić. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 23-7(1955) Mar.

A distributed amplifier of two stages, using tubes with secondary emission, is described. Details of construction are outlined. (C.W.H.)

5099

STORAGE DEVICES FOR HIGH SPEED CALCULATORS. A. D. Booth (Birbeck Coll., London). Research (London) 8, 130-40(1955) Apr.

Several different physical systems which have been or could be used for storage devices are described, including thermal storage, optical storage, liquid and solid sonic delay lines, electrochemical and electrostatic storage, Williams tube storage, Forrester-Haeff system, ferroelectric storage, capacitor and magnetic drum storage, and magnetic core storage. (L.T.W.)

5100

NEW FLUORESCENCE PHOTOMETER. Frank J. Lynch and James B. Baumgardner (Argonne National Lab., Lemont, Ill.). Rev. Sci. Instr. 26, 435-40(1955) May.

An instrument for microanalytical analysis by a fluorescence method which is sensitive, linear, and stable is described. Both an unknown and a reference sample of the same constitution are excited to fluorescence by ultraviolet light emitted in pulses by an a-c powered mercury arc lamp. The resulting pulsed fluorescent light from each sample is incident on a separate vacuum phototube. The ratio of the fundamental a-c components of the photoelectric currents flowing in the two phototubes is measured automatically by a servomechanism. In such a system, the measurement is independent of the intensity of the exciting ultraviolet light, the thermionic currents of the two phototubes, and the temperature of the fluorescent samples. A simplified optical system provides good efficiency. Either solid or liquid samples may be rapidly measured. For U analysis the instrument may be calibrated to read full scale for $5 \cdot 10^{-10}$, $5 \cdot 10^{-9}$, $5 \cdot 10^{-8}$, and $5 \cdot 10^{-7}$ g of U. Although it is designed primarily for U analysis, the filters may be changed to permit measurement of other materials which can be analyzed by fluorescence methods. (auth)

5101

CHARACTERISTICS OF A HIGH-FREQUENCY COCKCROFT-WALTON VOLTAGE SOURCE. R. A. Peck, Jr. (Brown Univ., Providence, R. I.). Rev. Sci. Instr. 26, 441-4(1955) May.

Direct voltage output and ripple from a conventional cascade rectifier voltage multiplier have been observed under various conditions of operating frequency, load current, and number of doubler stages. Four types of voltage "loss" and two of ripple are identified, and their dependence on the above parameters is discussed. For six units operated at 32 kc the "voltage efficiency" varies from 90 percent without load to 80 percent when 8 ma are drawn; at 60 cps it is 42 percent without load. From the nature of the loss and ripple components it is clear that there is a maximum fruitful operating frequency for a supply of this type, only slightly above 800 cps in the present case. (auth)

5102

MEASUREMENT OF MAGNETIC FIELD GRADIENTS. J. F. Frazer, J. A. Hofmann, M. S. Livingston, and A. M. Vash (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 26, 475-6(1955) May.

A simple instrument for measuring magnetic field gradients with ½% accuracy is described, consisting of a small search coil vibrated at 100 cps by a loudspeaker. The application of this instrument to field gradient measurements on a magnet with hyperbolic pole pieces is described, together with some considerations on constant gradient shimming. (auth)

MASS SPECTROGRAPHY

5103

ION SOURCE WITHOUT AUXILIARY MAGNETIC FIELD FOR THE MASS SPECTROMETER. Dragutin D. Gvozdanović. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 45-8 (1955) Mar. (In French)

5104

DETERMINATION OF ISOTOPIC MASSES AND ABUNDANCES BY MASS SPECTROMETRY. Alfred O. Nier. (Univ. of Minnesota, Minneapolis). Science 121, 737-44 (1955) May 27.

A review of mass spectrometer design and application is presented. The design of a double-focusing mass spectrometer is described. The use of mass spectrometers in atomic mass determinations, isotope and gas analyses, and calculation of atomic weights is discussed. A table is presented of the atomic weights of the elements with a comparison of the 1953 international values and values computed from physical measurements. (M.P.G.)

5105

MASS SPECTROMETRIC INVESTIGATION OF ORGANOCHLORSILANES. N. N. Sokolov, K. A. Andrianov, and S. M. Akimova. Zhur. Obshchei Khim. 25, 675-83(1955) Apr. (In Russian)

MATHEMATICS

5106

SIMPLE ELECTRONIC EXTRAPOLATIONS OF SAMPLED DATA. Tihomir Ž. Aleksić. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 37-42(1955) Mar.

Simple electronic circuits for extrapolation of sampled data are discussed. The method based on first differences formulae is found to be very convenient in proposed analog technique. The circuit developed for generation of first differences can be used in the case of constant and variable sampling intervals. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

5107 AERE-T/M-115

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

FEASIBILITY OF A PROPOSED METHOD OF MEASUREMENT OF INTERMEDIATE NEUTRON SPECTRA. J. B. Sykes. Feb. 1955. 10p.

Provisional results are given regarding the possibility of measuring intermediate neutron spectra by a time-of-flight method using a pulsed point source of fast neutrons and a counter sensitive only during a certain period. It is shown that the proposed experiment is feasible only for fairly light moderators. The transport equation is solved by the polynomial approximations method introduced by Spencer and Fano. (auth)

5108 GPI-17

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

MULTIPLE ANODE ANTI-COINCIDENCE ANNULUS COUNTERS. I. L. Fowler. Aug. 16, 1954. 11p.

Several types of multiple anode anti-coincidence annulus counters for use in reducing background in various counting equipments are described. Constructional details and characteristics are given. (auth)

5109 HEPL-38

Stanford Univ., Calif. High-Energy Physics Lab.

SCINTILLATION PHENOMENA IN NaI AND CsF (thesis). Wesley J. Van Sciver. Apr. 1955. 128p. Contract N6onr-25116.

The spectra of the luminescence from Tl-activated and unactivated NaI and CsF crystals were measured in the temperature range −190°C to +125°C using α particles, γ rays, and ultraviolet light as sources of excitation. Results are presented graphically. An analysis is presented of factors contributing to scintillation emission following activation of crystals of NaI and CsF, and a qualitative explanation is presented of scintillation phenomena in NaI. (C.H.)

5110 ISC-599

Ames Lab., Ames, Iowa.

A PRESSURE REGULATOR FOR A LOW-PRESSURE CONTINUOUS-FLOW IONIZATION CHAMBER. Ralph A. Lowry, John E. Osher, and Glenn H. Miller. Apr. 19, 1955. 12p. Contract W-7405-eng-82.

A description is given of an automatic pressure-regulating device for a continuous-flow ionization chamber operated in the pressure range of 1 to 10 mm Hg. The pressure monitor consisted of an oil manometer, a light source, and two phototubes arranged whereby any small change in pressure gave rise to a corresponding electrical signal. This signal was used to control the power to a thermal gas flow valve. The regulator was capable of maintaining the pressure constant to within 0.03 mm Hg for a period of at least 24 hours. (auth)

5111 LA-1894

Los Alamos Scientific Lab., N. Mex.

A PORTABLE APPARATUS FOR THE DETERMINATION OF TRITIUM IN BODY FLUIDS AND AQUEOUS SOLUTIONS. B. Eutsler, M. Robbins, R. Hiebert, and J. Larkins. Apr. 1955. 15p. Contract W-7405-Eng-36.

A small portable apparatus has been developed for the determination of tritium in body fluids and aqueous solutions. The entire system is adaptable to operation by untrained personnel. The small glass vacuum manifold and ionization chamber are evacuated by means of water aspiration and filled to atmospheric pressure with a mixture of hydrogen–tritium gas. The hydrogen–tritium mixture is evolved by dropping a liquid (sputum, urine, blood, or water) onto metallic clacium and passing the gas through a drying column filled with indicating Drierite. The current produced by the beta activity within the ionization chamber is measured with either Applied Physics Corporation Vibrating Reed Electrometer or a battery powered ionization chamber current meter. The method has a range of 10 to 10,000 μc of tritium per liter of liquid, depending upon the size of the ionization chamber and the measuring instrument. (auth)

5112 NP-5665

Canada. Dept. of Mines and Technical Surveys. Mines Branch.

PORTABLE DIRECTIONAL GEIGER COUNTERS. A. H. Bettens, C. Lapointe, and G. G. Eichholz. Aug. 28, 1954. 20p. (TR-122/54)

The development of a series of new portable counters primarily for underground use, is described. The weight and size of the counters has been reduced considerably below that of comparable commercial units, chiefly by the elimination of amplifier tubes, made possible by operating the halogen-quenched Geiger tube in the corona-spark region. Several different models are described using different vibrator units and battery sizes, and possible adaptations for a variety of uses are discussed. (auth)

5113 R52GL167

General Electric Co. General Engineering Lab., Schenectady, N. Y.

AIR SAMPLING CHAMBER FOR S.I.R. R. A. Dewes and E. E. Goodale. Aug. 8, 1952. 8p. Contract [W-31-109-Eng-52].

The design and performance are described of a sturdy, light-weight air sampling chamber for the continuous monitoring of representative air samples for β activity. (C.H.)

5114 UCRL-2985

California. Univ., Berkeley. Radiation Lab.

LIQUID HYDROGEN BUBBLE CHAMBERS (thesis). Harry Cline Dittler and Thomas Frank Gerecke. May 10, 1955. 74p. Contract W-7405-eng-48.

Submitted as a thesis to the United States Naval Postgraduate School, Monterey, Calif.

An ionizing particle, under the proper conditions, forms a string of bubbles along its path through a superheated liquid. Although spontaneous boiling in a chamber of glass and metal construction has limited the duration of superheat to approximately 50 msec, the tracks of particles from a pulsed accelerator have been photographed with great success. The characteristics of a detector that utilizes this principle permit taking photographs with little or no background contamination at a frequency matching the pulse rate of Bevatron-Cosmotron type accelerators. A 4-in. liquid hydrogen bubble chamber has been built and operated successfully in the beams of the Berkeley synchrocyclotron (184-in. cyclotron) and the Bevatron. This chamber and its associated control and instrumentation equipment are described in some detail. Basic theoretical considerations, advantages, preliminary physics experiments, and future developmental planning are also discussed. (auth)

5115 UCRL-2990

California. Univ., Berkeley. Radiation Lab.

A TOTAL ABSORPTION SPECTROMETER FOR GAMMA RAYS (thesis). Malvern H. L. Jester. May 13, 1955. 37p. Contract W-7405-eng-48.

Submitted as a thesis to the United States Naval Postgraduate School, Monterey, Calif.

A description of a total-absorption spectrometer for gamma rays is given. The spectrometer depends on the Cherenkov radiation emitted in 14 inches of lead glass by the shower electron-positron pairs formed by an incident gamma ray. The Cherenkov radiation is detected only when four photomultipliers looking at the glass operate in coincidence. The added output of the photomultipliers is analyzed with a ten-channel pulse-height analyzer. The relative pulse-height output of the spectrometer varies linearly as the energy of incident monoenergetic electrons is varied from 42 to 319 Mev. The energy resolution is about 30%. It is believed that the useful range of the spectrometer will extend to several Bev. (auth)

5116 UCRL-2996

California. Univ., Berkeley. Radiation Lab.

HIGH-ENERGY INDUCED FISSION THEORY AND APPLICATION (thesis). Robert R. Hart. May 11, 1955. 36p. Contract W-7405-eng-48.

Submitted as a thesis to the United States Naval Postgraduate School, Monterey, Calif.

A brief description of the mode of fission of bismuth by deuterons and a comparison of this type of fission with slow-neutron fission of U^{235} is summarized in this article. The construction of two types of Bi-fission ionization chambers is described in detail. The operating characteristics of one such chamber, the Cr-5, containing 30 g of Bi, are listed. A brief review of cosmic-ray phenomena is included which points to the field wherein this type of chamber could be used to best advantage. (auth)

5117 WAL-844/18-1

Watertown Arsenal Lab., Mass.

THE CALIBRATION OF A BETA-RAY SPECTROMETER. Alfred J. Moses and Roger P. Vancour. May 10, 1955. 16p.

A β-ray spectrometer that was designed and constructed at Watertown Arsenal Laboratory has been calibrated by means of a nuclear resonance flux meter and tested using a Tl^{204} standard. The β-ray spectrometer was used to determine the average energy of β particles emitted by a Tl^{204} standard. A value of 0.275 Mev was obtained, in good agreement with published data. The β-ray spectrometer was also used to determine the maximum β-ray energy of the Tl^{204} standard. The low intensity of the standard and the necessity to keep the time of counting short to prevent overheating of the magnet led to some inaccuracy in results. Use of sources one hundred times more intense than the Tl^{204} standard, i. e., 5×10^{-4} mc instead of 5×10^{-6} mc will be required for accurate maximum energy determinations. (auth)

5118 AECL-176

CONCERNING THE DETERMINATION OF THE ANALYTICAL REPRESENTATION OF THE TRAJECTORIES OF CHARGED PARTICLES IN MAGNETIC FIELDS OF AXIAL SYMMETRY, USED IN PRESENT DAY β-SPECTROMETERS. V. R. Saulit. Translated from Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 18, 227-32(1954). 14p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-6350.

5119

LOADED NUCLEAR EMULSIONS WITH GLASS TUBES. J. Catalá and J. Casanova. Anales real soc. expañ. fís. y quim. (Madrid) Ser. A 51, 77-84(1955) Mar.-Apr. (In Spanish).

A new technique for the preparation of loaded emulsions with tubes of glass filled with the solution of the target element is presented. Some details about the manufacture of the tubes and applications to the study of light fragments emitted during the uranium trifission when bombarded with slow neutrons are also described. (auth)

5120

A POSSIBLE INTERPRETATION OF THE SCINTILLATION EFFECT IN CRYSTAL DETECTORS. Nicolas Nifontoff. Compt. rend. 240, 1695-7(1955) Apr. 25. (In French)

An interpretation of the scintillation effect in crystal detectors is proposed, based on fluctuations of the recombination and production currents across the potential barrier. The agreement with experimental results is good. (tr-auth)

5121

APPLICATION OF SCINTILLATORS TO THE PHOTOGRAPHIC DETECTION, IN VIVO, OF RADIOACTIVITY IN AN ORGANISM. Claude Kellershohn and Pierre Pellerin. Compt. rend. 240, 1816-18(1955) May 2. (In French)

5122

A MULTICHANNEL COINCIDENCE DEVICE. Olga V. Protić and Boris Vošicki. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 29-35(1955) Mar.

A 16 channel device for investigating coincidences of pulses from radiation detectors and similar devices is described. (auth)

5123

MANUAL OF NUCLEAR INSTRUMENTATION. New York, Nucleonics, McGraw-Hill Publishing Co., Inc., [1955?]. 96p. $0.50.

Twenty-four recent articles from Nucleonics present the latest tested instrumentation methods and devices for radiation detection and measurement. (C.H.)

5124

REMARKS ON THE OPERATION OF THE DIFFUSION CLOUD CHAMBER. I. P. E. Argan and N. D'Angelo (Univ. of Rome) and A. Gigli (Univ. of Genova, Italy). Nuovo cimento (10) 1, 761-84(1955) May. (In English)

A theoretical study has been carried out on a diffusion cloud chamber operating with methyl-alcohol vapor in air at normal pressure, and with a strong temperature gradient.

Temperature distribution, vapor pressure and supersaturation have been calculated as functions of the number of ions formed per cm^3/sec in the interior of the chamber. The calculated height of the sensitive layer is consistent with the experimental observations. The study has been extended to the case in which the various quantities depend on both vertical and horizontal coordinates. Information has been obtained about the perturbation of the structure of the sensitive layer as the result of introducing plates inside the chamber with a certain temperature distribution. In particular, the approximate distance from these plates (or from the side walls of the chamber) at which tracks of ionizing particles are still observable has been determined. (auth)

5125

ON ADDING CIRCUITS. M. Cervasi and G. Fidecaro (Univ. of Rome). Nuovo cimento (10) 1, 942-8(1955) May. (In Italian)

Two types of adding circuits used in a cosmic ray experiment in connection with a large Geiger counter hodoscope are described. Precision and long-range stability of the output pulses are discussed. In one of the two circuits, the operating conditions of the pulse shaping tubes are rather unusual. As a consequence of the very low plate voltages used, the tubes exhibit a negative transconductance over a certain range of control grid voltages. This effect and its influence on the stability of the circuit are also discussed. (auth)

5126

FLUORESCENT URANIUM GLASS. Olga Ž. Kovačević and Velimir N. Kostić. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 49-52(1955) Mar.

A scintillation counter utilizing uranium glass has been used for thermal neutron flux measurements. An efficiency of ~ % was obtained. (C.W.H.)

5127

USE OF MELAMINE AS AN X-RADIATION DETECTOR. Milton Birnbaum, James Schulman, and Leo Seren (Naval Research Lab., Washington, D. C.). Rev. Sci. Instr. 26, 457-9 (1955) May.

Melamine, in the form of a clear plastic material, can be used as an x-radiation detector in the range from hundreds to millions of roentgens. The effect of radiation is to increase the optical absorption of melamine for wavelengths from 330 to 480 mμ. The change in absorption produced by the radiation is greater at shorter wavelengths of light. However, in practice a compromise must be realized because the natural absorption of melamine also increases steeply as the wavelength of light is decreased. Preliminary experiments with 11-Mev bremsstrahlung radiation and with Co^{60} γ rays indicate that the dosimeter properties are roughly independent of the x-ray energy. (auth)

5128

SOME REMARKS AS TO DARK CURRENT AND PULSE-HEIGHT DISTRIBUTION IN E.M.I. 6260 PHOTOMULTIPLIERS. I. Pelchowitch (Centre d'Etudes Nucleaires de Saclay, France). Rev. Sci. Instr. 26, 470-4(1955) May.

Bias curves measured with an E.M.I. 6260 photomultiplier tube for dark current, and single photoelectrons emitted from the cathode under light stimulation, are discussed. It is shown that the dark current has a multielectron emission component, the major part of which can be attributed to the K^{40} content of the glass. Pulse-height distributions are shown to be dependent on focusing characteristics of the multiplier and to broaden when space-charge limitation occurs. (auth)

MESONS

5129 UCRL-3031

California. Univ., Berkeley. Radiation Lab.
POSITIVE HEAVY MESONS PRODUCED AT THE BEVATRON. Robert W. Birge, Roy P. Haddock, Leroy T. Kerth, James R. Peterson, Jack Sandweiss, Donald H. Stork, and Marian N. Whitehead. June 6, 1955. 12p. Contract W-7405-eng-48.

Techniques and preliminary results are described which were obtained when nuclear emulsions were exposed to 114-, 133-, and 170-Mev positive heavy mesons produced at 90° by 5.7-Bev protons striking a copper target. The exposures were made using the strong-focusing spectrometer. The mass of each heavy meson was determined by measuring the range of the meson in a nuclear emulsion stack and by following its track back to the point of entrance. The momentum of each meson was then determined by measurement of the range of the protons entering the stack at the same point. (C.H.)

5130

ON THE PRODUCTION OF SECONDARY ELECTRONS BY HIGH ENERGY μ-MESONS. G. Cagliotl and S. Sciuti (Univ. of Rome) and A. Gigli (Univ. of Genova, Italy). Nuovo cimento (10) 1, 851-62(1955) May. (In English)

With a counter hodoscope expressly designed for the study of secondary electrons, the generation of electronic secondaries in successive layers of material (Al or Pb) by μ mesons has been studied. An examination of these results, in conjunction with hodoscope data already in part published, shows that the discrepancies between cloud chambers and hodoscope measurements can be fully explained. (auth)

5131

EVIDENCE FOR HEAVY MESONS WITH THE DECAY PROCESSES $K_{\pi 2} \rightarrow \pi + \pi^0$ AND $K_{\mu 2} \rightarrow \mu + \nu$ FROM OBSERVATIONS WITH A MULTIPLATE CLOUD CHAMBER. H. S. Bridge, H. DeStaebler Jr., B. Rossi, and B. V. Sreekantan (Massachusetts Inst. of Tech., Cambridge). Nuovo cimento (10) 1, 874-7(1955) May. (In English)

Analysis of the data on S events observed in the M.I.T. multiplate cloud chamber shows that these events represent the decay processes of two kinds of heavy mesons. The decay processes are of the type: $K_{\mu 2} \rightarrow \mu + \nu$ and $K_{\pi 2} \rightarrow \pi + \pi^0$. (auth)

5132

ON HEAVY UNSTABLE PARTICLES PRODUCED IN HIGH ENERGY NUCLEAR DISINTEGRATIONS. C. Dahanayake, P. E. Francois, Y. Fujimoto, P. Iredale, C. J. Waddington, and M. Yasin (Univ. of Bristol). Nuovo cimento (10) 1, 888-903(1955) May. (In English)

The results of a systematic investigation into the production of heavy unstable particles in energetic nuclear disintegrations are reported. Mass measurements by the grain density—range method have been made in order to detect K mesons independently of any secondary effects. Measurements were made on tracks which satisfied certain geometrical criteria and which originated in disintegrations of energy greater than ~ 2 Bev. The velocity range studied for K mesons was from 0.25 c to 0.56 c. Ten K mesons and two hyperons were found. The two hyperons and one of the K mesons decayed in flight. All the particles decayed into single charged secondaries. Both hyperons were emitted from disintegrations which also produced K mesons. These associated pairs have been reported previously. The results are consistent with the view that hyperons and heavy mesons are mainly produced in association, and that, in the energy range considered, K mesons show a large charge disparity. Two additional hyperons were found one of which appears to be an example of the decay scheme $Y^{\pm} \rightarrow \Lambda^0 + \pi^{\pm} + \sim 60$ Mev. A value for the lifetime of the hyperons is estimated from six suitable examples found in this laboratory. Mass measurements have been made on the tracks of 17 K mesons. The mean value obtained is 985 ± 16 m_e. (auth)

5133

RESULTS ON SOME SECONDARY PARTICLES OF K-MESONS FROM THE STACKS FLOWN IN SARDINIA 1953. A. Bonetti, R. Levi Setti, and B. Locatelli (Univ. of Milan, Italy). Nuovo cimento (10) 1, 904-14(1955) May. (In English)

The results of measurements on secondaries of K particles found in stacks of stripped emulsions exposed at high altidude from Sardinia in 1953 are given. Among the 8 secondaries, one has been identified as a π meson and one as a μ meson. The other 6 form a group whose ionization is near the plateau and whose $p\beta$ is about 200 Mev/c. The K particle with π meson secondary can be classed as a χ meson, that with an identified μ secondary is probably a κ. The remaining 6 secondaries can be interpreted as the products of the K_μ decay, and the mass of the K_μ can be determined from their mean $p\beta$. The methods of measurement and some possible sources of error are discussed critically. (auth)

5134

FURTHER DISCUSSION OF THE $K\mu$ DECAY MODE. R. Armenteros, B. Gregory, A. Hendel, A. Lagarrigue, L. Leprince-Ringuet, F. Muller, and C. Peyrou (Ecole Polytechnique, Paris) Nuovo cimento (10) 1, 915-41(1955) May. (In English)

After a description of the methods used in the measurements of momentum and range, the data on 46 S events obtained with a double cloud chamber experiment are examined. Momentum-range measurements on 22 positive S's give a mass consistent with a single value at (928 ± 13) m_e. The analysis of the ranges of the secondaries shows, however, that not all S events can be explained by a single decay mode. A large proportion of the secondaries correspond to a light meson of unique range (75.7 ± 1.7) g/cm^2 in Cu. The comparison of this range with the measured masses of the primary particles proves that these secondaries are μ mesons. The accompanying neutral secondary is shown at the same time to be a particle of zero mass. The absence of cascade showers associated with S events with long-range secondaries shows that the neutral secondary is a neutrino. The decay mode $K_\mu \rightarrow \mu + \nu$ previously proposed is more firmly established. Two independent mass estimates are obtained for the K_μ particle. A final best mass of (935 ± 15) m_e is obtained by the combination of the two estimates after taking into account possible additional errors. The K_μ particle is then shown to be essentially positive and to constitute (66 ± 18)% of the S's which passed through the top chamber. No precise information can be obtained as to the mode of decay of S particles which are known not to belong to the K_μ-decay mode. (auth)

5135

ON THE MEAN LIVES OF HEAVY UNSTABLE PARTICLES. N. Dallaporta (Univ. of Padova). Nuovo cimento (10) 1, 962-5(1955) May. (In English).

It has been suggested that the abundant production of heavy unstable particles in nuclear events can be reconciled with their long mean life by assuming special selection rules allowing only those reactions in which two heavy particles are produced together. In the present paper, it is shown that the right order of magnitude for the mean lives of heavy particles can be deduced within the framework of the suggested selection rules by the exclusive use of interaction constants already know from interactions of "normal" particles. Several examples are presented. (M.P.G.)

5136

REMARKS ON THE MULTIPLE ELECTROMAGNETIC INTERACTIONS OF μ MESONS. D. Kessler and R. Maze (École Normale Supérieure, Paris). Nuovo cimento (10) 1, 966-7(1955) May. (In French)

Previous results presented on the electromagnetic interaction of μ mesons in producing penetrating showers indicated that the phenomenon was not independent of experimental conditions. Recent measurements reported here show a slight but definite energy dependence. It is further shown that the type of experimental arrangement is important, particularly in triple processes. (K.S.)

NEUTRONS

5137 LA-1908

Los Alamos Scientific Lab., N. Mex.

SOME EIGENVALUE PROBLEMS IN THE TRANSPORT THEORY OF NEUTRONS. Stewart I. Schlesinger. June 1955. 124p. Contract W-7405-eng-36.

This thesis contains a study of the linear homogeneous integral equation which describes the diffusion or migration of neutrons in an infinite slab of finite but arbitrary width. Both the eigenvalues and eigenfunctions of this integral equation come under consideration. Simple but rather crude upper and lower bounds are found directly for the eigenvalues of the integral equation; however, the methods employed do not lend themselves to further refinement. In order to obtain more detailed information concerning the eigenvalues (and eigenfunctions as well), methods of approximation are developed which reduce the integral equation eigenvalue problem to a matrix eigenvalue problem. These approximation techniques are so developed that they may be applied to any real, symmetric, square integrable kernel. If one is also interested in a pointwise approximation of the eigenfunctions, the same techniques are applicable, provided the kernel satisfies certain additional hypotheses which insure that the eigenfunctions are both continuous and bounded. The approximation techniques are applied to the integral equation describing diffusion of neutrons in the infinite slab, yielding the eigenvalues and eigenfunctions to a reasonable degree of accuracy. Both Legendre polynomials and Haar functions (a set of step functions which are complete on a finite interval) are used as base functions in the approximations. (auth)

NUCLEAR PHYSICS

5138 BNL-331

Brookhaven National Lab., Upton, N. Y.

STATISTICAL ASPECTS OF THE NUCLEUS. A CONFERENCE HELD AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 24 TO 26, 1955. R. M. Eisberg, P. C. Gugelot, and C. E. Porter, [eds.]. [Apr. 1955]. 116p.

In the first talk, low-energy average cross sections and nuclear resonance lines are discussed. A comparison is made of the cloudy crystal ball model and the intermediate model, which are used to interpret the low energy average cross sections. In the second talk, the present status of the theory of the compound nucleus is reviewed, with emphasis on the distinction between compound and noncompound nuclear reaction processes. The problem of elastic scattering is reviewed in the third talk within the framework of the optical model. The problem of inelastic scattering to discrete levels is discussed in two talks, one of which uses the compound nucleus approach, and the other, the direct interaction approach. The reaction theory is discussed in the final paper in connection with inelastic scattering to continuum states. A recapitulation of the conference and discussions throughout the conference are included. (M.P.G.)

5139

ISOTOPIC SPIN AND THE HYPOTHESIS OF NEUTRON CHARGE. Ya. P. Terletskii (Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 101, 1035-8(1955) Apr. 21. (In Russian)

5140

INTERNAL BREMSSTRAHLUNG IN 0–0 TRANSITIONS OF THE NUCLEUS. I. S. Shapiro and Yu. V. Orlov (Moscow State Univ.). Doklady Akad Nauk S.S.S.R. 101, 1047-9(1955) Apr. 21. (In Russian)

5141

ON THE EXTENT OF ORIENTATION OF NUCLEI. G. P. Khutsishvili (Georgian Academy of Sciences). Zhur. Eksptl'. i Teoret. Fiz. 28, 496-8(1955) Apr. (In Russian)

NUCLEAR PROPERTIES

5142

ON THE QUESTION OF THE LIFE TIME OF ISOMERIC NUCLEI. E. P. Mazets and L. I. Rusinov (Leningrad Physico-Technical Inst.). Doklady Akad. Nauk S.S.S.R. 101, 253-6(1955) Mar. 11. (In Russian)

5143

PROTON RELAXATION IN PURE LIQUIDS AND IN LIQUIDS CONTAINING PARAMAGNETIC GASES IN SOLUTION. G. Chiarotti, G. Cristiani, and L. Giulotto (Univ. of Pavia, Italy). Nuovo cimento (10) 1, 863-73(1955) May. (In English)

Some data on proton relaxation times in pure liquids completely free of oxygen in solution are reported. The observed values of T_1 are generally greater than those found by other authors. The value found for water agrees well with the value predicted by the theory of Purcell and coworkers. The experimental values of T_1 for benzene, chlorobenzene and nitrobenzene seem to be somewhat longer than those evaluated following Purcell's theory. The possible causes of the observed deviations (quasi-crystalline structure of liquids, microviscosity effect and molecular associations) are discussed. The influence of dissolved paramagnetic gases O_2 and NO is also studied. The magnetic moment of O_2 effective for the relaxation is of the same order of magnitude of the one derived from susceptibility measurements in the gas and is independent of the solvent. The μ_{eff} of NO on the contrary is considerably smaller than that resulting from susceptibility measurements and decreases with increasing polarity of the solvent. This behavior of μ_{eff} of NO is attributed to interactions of the orbital magnetic moment with nonuniform local electric fields of the solvent. (auth)

5144

NUCLEAR BINDING ENERGIES. J. Mattauch (Max-Planck-Inst. of Chemistry, Mainz, Germany). Science 121, 745-50 (1955) May 27.

A general discussion of nuclear binding energies is presented. The building up of nuclides from nucleons, Aston's law of integers and the variation of binding energy per nucleon with the number of nucleons in a nuclide, closed shell, and the use of the liquid drop model of the nucleus are discussed with frequent reference to photographs obtained in mass spectrographic analyses. (M.P.G.)

5145

TABLES OF NUCLEAR MOMENTS. E. F. Kyul'ts, V. V. Kunts, and V. G. Khartman. Uspekhi Fiz. Nauk 55, 537-93 (1955) Apr. (In Russian)

5146

HYPERFINE STRUCTURE OF SPECTRAL LINES AND SPINS OF U^{233} AND Pu^{239} NUCLEI. L. A. Korostyleva, A. R. Striganov, and N. M. Yashin. Zhur. Eksptl'. i Teoret. Fiz. 28, 471-9(1955) Apr. (In Russian)

Experimental data on the U^{233} and Pu^{239} spectra are reported. Spins of $^5/_2$ and $^1/_2$, respectively, are derived. (G.Y.)

NUCLEAR REACTORS

5147 HW-34476

Hanford Atomic Products Operation, Richland, Wash.
A REACTOR CONTROL SYSTEM UTILIZING BORON TRIFLUORIDE GAS. W. E. Cawley. Jan. 18, 1955. 20p. Contract W-31-109-Eng-52.

A simple reactor control system utilizing BF_3 has been installed in the Hanford 305 reactor. This control system is described as well as its application to other research reactors such as the MTR. The system works on the principle that if BF_3 is introduced into a tube located within the neutron flux, some of the neutrons will be absorbed by the B^{10}. The number of neutrons absorbed will be a function of the number of B^{10} atoms present in the flux which is proportional to the pressure exerted upon the gas. Thus by varying the gas pressure, the macroscopic absorption cross section of the gas in the control may be changed. (L.T.W.)

5148 IDO-16228

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
AN ENGINEERING TEST REACTOR FOR THE MTR SITE. (A PRELIMINARY STUDY). R. M. Jones, M. H. Bartz, D. R. deBoisblanc, G. H. Hanson, J. R. Huffman, C. F. Leyse, J. H. Rainwater, M. E. Thomas, and J. W. Webster. May 23, 1955. 55p. Contract AT(10-1)-205.

This report presents the results of a one-month study of an engineering test reactor to be located at the National Reactor Testing Station, MTR Site. General plans are presented for a 75 megawatt light-water-cooled, light-water-moderated, beryllium-reflected reactor in which primary emphasis is placed on relatively large volume high fast neutron flux facilities through the reactor for accommodating loop type experiments. Benefits of MTR design, construction, and operating experiences have been incorporated to the fullest extent in arriving at a simplified MTR type reactor which could be designed and built with proven technology and little or no parallel development programs. (auth)

5149 NCSC-72

North Carolina State Coll., Raleigh. School of Engineering.
RALEIGH RESEARCH REACTOR. SUMMARY REPORT NO. 2. [R. L.] Murray and [Arthur W.] Waltner. May 3, 1954. 12p. (AD-37803)

Control rod and temperature experiments performed in the Raleigh Research Reactor are reported. Indium foil measurements are summarized. (L.T.W.)

NUCLEAR TRANSFORMATION

5150 OSR-TN-55-135
Stanford Univ., Calif.
DEUTERON MODEL CALCULATION OF THE HIGH-ENERGY NUCLEAR PHOTOEFFECT. TECHNICAL REPORT NO. 13. K. G. Dedrick. May 1955. 27p. Contract AF18(600)-545.

The high-energy nuclear photoeffect has been calculated according to the "deuteron model" of Levinger. In this model, the photo process occurs when a neutron and a proton which are scattering one another inside the nucleus absorb the energy of the incident photon and escape from the nuclear potential well into the laboratory. The nuclear photoeffect cross section is then obtained by averaging the cross section for the above process over all possible neutron-proton pairs in the nucleus, assuming a nucleon momentum distribution. The electric dipole and quadrupole interactions of the radiation field with the neutron and proton are included, and the magnetic terms are neglected. The averaging over all neutron-proton pairs is performed by means of a radom flight formulation of the problem. The analytical work involved may conveniently be done using either a zero temperature Fermi ground state nucleon momentum distribution or a gaussian distribution. Numerical results for the energy and angle distributions of photoneutrons and photoprotons are presented in the case of the gaussian distribution for 4 photon energies between 50 and 125 Mev. (auth)

5151
ANGULAR DISTRIBUTION OF PROTONS FROM THE REACTION $O^{16}(d,p)O^{17}$. Mira K. Jurić and Miodrag M. Petrović. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 1-6(1955) Mar.

The angular distribution of long-range protons from the $O^{16}(d,p)O^{17}$ reaction was observed by bombarding a thin oxygen target with deuterons of the energies 0.6, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, and 1.45 Mev. The coefficients of Legendre polynomials were calculated for the angular distribution curves and plotted as function of energy. (auth)

5152
ANGULAR DISTRIBUTION OF PROTONS AND TRITONS FROM REACTIONS $Be^9(d,p)Be^{10}$ AND $Be^9(d,t)Be^8$. Mira K. Jurić. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 7-13(1955) Mar.

The angular distributions of protons and tritons for the $Be^9(d,p)Be^{10}$ and $Be^9(d,t)Be^8$ reactions were observed by bombarding a thin Be target with deuterons of the energies 0.6, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, and 1.45 Mev. The coefficients of the Legendre polynomials were calculated for the angular distribution curves and plotted as a function of energy. (C.W.H.)

5153
ON THE $Ne^{20}(d,p)Ne^{21}$ REACTION. Serge Gorodetzky, Théo Muller, and Marcel Port. Compt. rend. 240, 1704-7(1955) Apr. 25. (In French)

Proton distribution curves were obtained by bombardment of Ne^{20} by 0.83- and 1.16-Mev deuterons. Peaks corresponding to levels in the Ne^{21} nucleus were observed. A fifth level at 3.73 Mev is indicated. The proton excitation curve contains a maximum, pointing to a resonance level of the intermediate nucleus Na^{22}. This resonance level occurs near 12 Mev. (K.S.)

5154
DISINTEGRATIONS OF SEVERAL LIGHT ELEMENTS BY TRITONS STUDIED BY THE PHOTOGRAPHIC METHOD. Pierre Cüer, Denyse Magnac-Valette, and Germain Baumann. Compt. rend. 240, 1880-2(1955) May 9. (In French)

Several disintegrations of light elements are described which are rarer than the total disintegrations $Li^7 + H^3 \rightarrow 2He^4 + 2n$ and $Li^6 + H^3 \rightarrow 2He^4 + n$ previously studied. An order of magnitude for the cross sections of these reactions is given. Several weakly excited states of Li^8, He^6, and C^{14} are confirmed or proposed. (tr-auth)

5155
CALCULATION OF NEUTRON WIDTHS IN THE MODELS OF THE SEMITRANSPARENT NUCLEUS. P. E. Nemirovskii. Doklady Akad Nauk. S.S.S.R. 101, 257-8(1955) Mar. 11. (In Russian)

5156
FISSION OF HEAVY NUCLEI BY HIGH-ENERGY NEUTRONS. V. I. Gol'danskii, E. Z. Tarumov, and V. S. Pen'kina (Inst. of Chemical Physics). Doklady Akad. Nauk S.S.S.R. 101, 1027-30(1955) Apr. 21. (In Russian)

Fission cross sections of U^{235} and U^{238} for 120- and 380-Mev neutrons, of Bi^{209} over the range 120 to 380 Mev, and W^{184}, Th^{232}, Pt^{195}, Au^{197}, Tl^{204}, and Pb^{207} for 380-Mev neutrons are presented and discussed. (G.Y.)

5157
HIGH ENERGY NEUTRON REACTIONS AND THE NUCLEAR OPTICAL MODEL. L. C. Gomes and J. Leite Lopes. Nuovo cimento (10) 1, 792-9(1955) May. (In English)

Born's approximation is extended to the calculation of reaction and total cross sections. The results are compared with the experimental data on high energy neutron induced nuclear reactions under the assumption of a complex square well for the nuclear potential. This varies with the excitation energy, but the values adjusted for the total cross section do not fit the angular distribution of the scattered neutrons. (auth)

5158
SPIN-ORBIT FORCES AND THE β LIFETIME OF B^{12} AND Li^8. B. G. Jancovici. Nuovo cimento (10) 1, 840-50(1955) May. (In French)

The unfavored β transitions $Li^8 \rightarrow Be^8$ and $B^{12} \rightarrow C^{12}$ are explained by a mixing of supermultiplets in Be^8 and C^{12} through the spin-orbit force. This spin-orbit force can be estimated from the experimental ft values. In C^{12}, an effective force $a(l \cdot s)$, where $a \sim 5$ Mev, is obtained, in good agreement with the generally admitted numbers. On the other hand, in Be^8, a value $| a \sim |$ 1.6 Mev is obtained. This abnormally low value is discussed. (auth)

5159
COULOMB EFFECTS IN THE $^6Li(n,\alpha)^3H$ AND $^6Li(p,\alpha)^3He$ REACTIONS. J. Sawicki (Univ. of Warsaw). Nuovo cimento (10) 1, 957-61(1955) May. (In English)

A theoretical analysis is presented of the Coulomb effect in $Li^6(n,\alpha)H^3$ and $Li^6(p,\alpha)He^3$ reactions. It was found that the cross section for the (p,α) reaction for 6 Mev protons is several times smaller than the (n,α) reaction for 6 Mev neutrons due to the Coulomb effect of the incoming proton wave. (M.P.G.)

5160

THE ANGULAR DISTRIBUTION OF THE NEUTRONS FROM THE REACTION Li^7(d,n)Be^8 AND THE ENERGY LEVELS IN Be^8. B. Trumpy, T. Grotdal, and A. Graue. Univ. i Bergen Arbok, Naturvitenskap. Rekke, No. 8, 1-15(1953). (In English)

PARTICLE ACCELERATORS

5161 AERE-T/M-118

Gt. Brit. Atomic Energy Research Establishment,
Harwell, Berks, England.
PROTON DYNAMICS IN THE LINEAR ACCELERATORS. II. A/G-FOCUSSED SECTION, 10-50 MEV. N. M. King. Dec. 1954. 37p.

The phase and radial motion of protons in the first two tanks of the alternating gradient system has been computed. In contrast to the grid-focused section, the effects of phase oscillation upon the radial orbits are shown to be small. This result is significant since it demonstrates the sufficiency of considering only the synchronous proton, whose behavior is readily accessible to an analytic treatment. Acceptance and output "phase-diagrams", analogous to those derived in Part I, have been obtained. They indicate that the majority of protons expected to be available at 10 Mev will be accepted and will not make radial excursions greater than 1.0 cm from the axis between 10 and 50 Mev. The output beam at 50 Mev will lie within a radius of 1.0 cm and a divergence of ±0.3 degrees. (auth)

5162 CERN-PS/MM-14

[European Organization for Nuclear Research, Geneva.]
ETUDE DE DISPOSITIFS POUR L'ALIMENTATION EN IMPULSION DES MAQUETTES V ET SUIVANTES. (Study of Equipment for Pulse Supply of Models V and Those Following). Feb. 1955. 22p.

Consideration is given to the design of a suitable magnet power supply for the CERN synchrotron. Requirements for this unit call for a repetition cycle of 5 sec, the ability to provide a linear field rise to 12,000 gauss in 1 sec at the equilibrium orbit, the possibility of regulating and modifying the pulse shape over wide limits, and provision for the best reproducibility of the cycles. (K.S.)

5163 CERN-PS/MM-15

[European Organization for Nuclear Research, Geneva.]
MESURES DYNAMIQUES SUR LE MODELE AC V. (Dynamic Measurements on the Model AC V). Mar. 1955. 33p.

Measurements of B and n are reported from experiments performed on the AC V model of the CERN synchrotron magnet. Satisfactory performance of the magnet was obtained. (K.S.)

5164 CERN-PS/PL-4

[European Organization for Nuclear Research, Geneva.]
INJECTION DANS LE SYNCHROTRON. ABERRATIONS. (Injection in the Synchrotron. Aberrations). Apr. 1955. 28p.

Second-order aberrations of the particle beam between the linear accelerator and the synchrotron are studied in connection the maximum acceptance of the synchrotron. Particular attention is given to the aberrations introduced by the passage of the beam through the synchrotron leakage flux, and it is concluded that some rearrangement of the magnetic sectors is necessary to deal with this problem. (K.S.)

5165 HEPL-46

Stanford Univ., Calif. High-Energy Physics Lab.
A COMPARISON OF THE PREDICTED AND OBSERVED PERFORMANCE OF A BILLION-VOLT ELECTRON ACCELERATOR (thesis). Kenneth B. Mallory. May 1955. 168p. Sponsored by ONR and AEC under Contract N6onr-25116.

An investigation of the factors which contribute to the prediction and measurement of the energy output of the Stanford Mark III linear electron accelerator is reported. The measurement of the nominal operating characteristics of the accelerator and the study of discrepancies between the nominal and actual conditions of operation are considered in detail. Considerable attention is devoted to the measurement techniques developed for determining the r-f properties of a heavily loaded waveguide like the accelerator structure and for locating and identifying irregularities in the waveguide. The allowable limits of temperature of operation, frequency drift, frequency modulation and phase modulation are discussed. Methods of measuring and of reducing these phenomena are presented. The problem of maintaining the proper relative phase of 21 accelerator sections is considered in detail. The effective shunt impedance of each 10-ft section of the accelerator is found to be 111 × 10^6 ohms, after taking account of all the operating corrections described above. The measurement of power and energy, and the results of two useful determinations of the actual relation of energy output to power input in the accelerator are described. It is found that the predicted and observed energies agree to 3%. Desirable modifications of the accelerator to produce more reliable operation are described briefly. (auth)

5166 NP-5662

Brigham Young Univ., Provo, Utah.
MEASUREMENT OF MASSES AND RELATIVE ABUNDANCES OF NUCLEAR SPECIES BY CYCLOTRON RESONANCE. TECHNICAL REPORT NO. 1. THE DETERMINATION OF MASS RATIOS OF TWO IONS BY THE METHOD OF CYCLOTRON RESONANCE USING A FOUR-PLATE OMEGATRON (thesis). Hugh J. Woodford. May 1955. 48p. Contract DA-04-495-Ord-518.

The theory, design, construction, and operation of a 4-plate omegatron are described. It is shown that the simultaneous accelerations of ions of 2 kinds is feasible in a 4-plate omegatron. Very accurate values for the mass ratios of 2 ions should be obtained by this method. Preliminary values were obtained for the mass ratio of the proton and the H$_2^+$ ion. (M.P.G.)

5167 UCRL-2968

California. Univ., Berkeley. Radiation Lab.
INSTALLATION OF THE BEVATRON POWER SUPPLY (thesis). Robert Harry West. Apr. 19, 1955. 87p. Contract W-7405-eng-48.

An historical report on the installation of the Bevatron power supply at the University of California Radiation Laboratory is presented from the viewpoint of a project engineer. The report is an outline indication of how the actual physical installation was completed, as well as some of the theoretical problems involved in planning to direction of the work. (auth)

5168

THE INFLUENCE OF THE SPACE CHARGE IN AN ELECTRON BEAM ACCELERATED IN A CONSTANT ELECTRO-

STATIC FIELD UP TO ENERGIES OF SEVERAL MEV. M. Sangster. Appl. Sci. Research 4B, 261-70(1955). (In English)

Calculations show that the space charge must be considered in the acceleration of electrons to very high energies in a constant electrostatic field. (C.W.H.)

5169

HIGH-VOLTAGE ELECTROSTATIC GENERATOR IN COMPRESSED GAS. B. V. Baev, P. E. Vorotnikov, B. M. Gokhberg, N. I. Sidorov, A. V. Shuf, and G. B. Yan'kov (Vavilov Inst. of Physical Problems). Doklady Akad. Nauk S.S.S.R. 101, 637-9(1955) Apr. 1. (In Russian)

5170

STABILIZATION OF ENERGIES OF IONS ACCELERATED BY A HIGH-VOLTAGE ELECTROSTATIC GENERATOR. V. G. Brovchenko, B. M. Gokhberg, and V. M. Morozov (Vavilov Inst. of Physical Problems). Doklady Akad. Nauk S.S.S.R. 101, 1023-5(1955) Apr. 21. (In Russian)

5171

A CAVITY ACCELERATOR. J. Pottier. Nuovo cimento (10) 1, 949-52(1955) May. (In French)

A small, single cavity accelerator is described. Relatively light particles such as electrons, protons, and deuterons can be accelerated to energies of 200 to 300 kev. The accelerator is used primarily for the production of neutrons by (d,n) reactions and of x rays by the impact of accelerated electrons. (auth)

5172

HIGH-CURRENT COCKCROFT-WALTON ACCELERATOR FOR NEUTRON PRODUCTION. R. A. Peck, Jr. and H. P. Eubank (Brown Univ., Providence, R. I.). Rev. Sci. Instr. 26, 444-8(1955) May.

The 200-kev deuteron accelerator described utilizes a water-cooled T–Zr film as a source of 14-Mev neutrons. High voltage is provided by a Cockcroft-Walton generator of six oil-filled stages, operated at 32 kc. An r-f ion source provides up to 15 ma (90% deuterons), at least 10 ma of which can be focused on the target. A system of forced water cooling allows at least 5 ma (at 120 kev) to be used in bombarding the target foil without reaching a surface temperature of 100°C. Observed neutron yield is approximately 2×10^9 neutrons/sec ma from a target containing roughly one tritium atom per four of zirconium. (auth)

RADIATION ABSORPTION AND SCATTERING

5173 NYO-6273

Nuclear Development Associates, Inc., White Plains, N. Y. SINGLY SCATTERED ANGULAR FLUX OF GAMMA RAYS AT THE SOURCE ENERGY AND AT THE SINGLE SCATTERING CUTOFF. J. E. Wilkins, Jr. Feb. 10, 1955. 11p. Contract AT(30-1)-862. (NDA-15C-46).

Given an arbitrary monoenergetic source of gamma rays, a general relation is derived which connects the scattered angular energy flux at the source energy with the unscattered angular energy flux. A second relation connects the discontinuity in the scattered angular energy flux at the single scattering cutoff energy with the unscattered angular energy flux. (auth)

5174

RELATION BETWEEN POLARIZATION, ANGULAR DEPENDENCE OF SCATTERING CROSS SECTION, AND SIZE OF SPIN-ORBITAL COUPLING. I. I. Levintov (Inst. of Chemical Physics). Doklady, Akad. Nauk S.S.S.R. 101, 249-52(1955) Mar. 11. (In Russian)

5175

THE CHARGES CARRIED BY FAST NITROGEN, OXYGEN AND FLUORINE IONS PASSING THROUGH MATTER. K. G. Stephens and D. Walker (Univ. of Birmingham, England). Proc. Roy. Soc. (London) A229, 376-86(1955) May.

The distribution of charges carried by cyclotron-accelerated nitrogen, oxygen, and fluorine ions after passing through a thin Zapon film have been investigated by magnetic analysis. The dependence of the ionic charge on the velocity and on the atomic number of an ion passing through matter is found to be in good agreement with Lamb's criterion. (auth)

RADIATION EFFECTS

5176

EFFECT OF γ RADIATION ON POLYMERS OF THE SOLID STATE. I. RETICULATION OF POLYETHYLENE. Adolphe Chapiro. J. chim. phys. 52, 246-58(1955) Mar. (In French)

The reticulation of polyethylene exposed to γ radiation was investigated by measuring the fusion point of the irradiated polymer. An apparatus is described for measuring the elongation curves under constant load as a function of temperature, and for determining the rupture temperature of small polymer samples. The degree of reticulation was studied for different intensities of radiation when the irradiation was carried out in the presence and absence of air. The results show that in the presence of air, the necessary dose for yielding an unfusible polyethylene is 2.5 Mr if the irradiation is carried out at intensities above 400/r min. Below 100 r/min, an oxidized degradation of the polymer is observed. To interpret these observed phenomena, one is led to consider the formation of intermolecular links with a peroxide structure which decompose near 150 to 170°. If the irradiation is carried out in vacuum or in a N_2 atmosphere, with previously outgassed samples, the polyethylene becomes unfusible after a dose of 1 Mr. (tr - auth)

5177

ABSORPTION SPECTRUM AND THERMOLUMINESCENCE CURVE OF FUSED QUARTZ IRRADIATED BY X AND γ RADIATION. M. Lautout. J. chem phys. 52, 259-66(1955) Mar. (In French)

The absorption spectrum of fused quartz, irradiated by x or γ radiation, gives 5 bands located at 5.500, 3.700, 2.500, and 2.200 A. It is shown that these bands are related to the emission maxima of the thermoluminescence curve. (tr - auth)

5178

PHOTOSTIMULATION AND COLORATION OF FUSED QUARTZ IRRADIATED BY X OR γ RADIATION. M. Lautout. J. chim. phys. 52, 267-71(1955) Mar. (In French)

Fused quartz, previously irradiated by x or γ radiation, becomes phosphorescent under the action of visible or ultraviolet radiation. The initial exciting radiation furthermore causes a change in the coloration of the quartz, which appears striated with dark lines, occasionally affecting the appearance of the eddies. (tr - auth)

5179

PARAMAGNETIC RESONANCE OF X-RAYED TEFLON. E. E. Schneider (Duke Univ., Durham, N. C. J. Chem. Phys. 23, 978(1955) May.

Paramagnetic resonance absorption at 23,700 Mc has been observed in x-irradiated Teflon. The structure of the resonances has similarities to the structure found in x-irradiated Lucite. (C.W.H.)

5180

CHANGE IN KCl LATTICE BY SOFT X-RAYS. Chester R. Berry (Eastman Kodak Co., Rochester, N. Y.). Phys Rev. 98, 934-6(1955) May 15.

The lattice dimensions of powdered specimens of annealed and unannealed KCl were measured during irradiation by soft x rays. One set of specimens was allowed to color during irradiation and another group was prevented from coloring by simultaneous white-light illumination. The following observations were made: There was an increase in lattice dimension during exposure for every specimen. No difference existed for specimens which were colored or not colored. Saturation in the change in lattice dimension occurred at a lower exposure for the unannealed specimens than for the annealed specimens. The total increase in lattice dimension was about $\Delta a/a = 1 \times 10^{-5}$ for all specimens, compared with values given in the literature for maximum changes in length of approximately $\Delta l/l = 20 \times 10^{-5}$. The difference indicates production of void volume, persumably Schottky defects. The failure to observe a difference between colored and uncolored specimens may be caused by a considerably larger production of Schottky defects than of color centers. (auth)

5181

X-RAY-INDUCED LUMINESCENCE FROM AIR. William E. Spicer (Univ. of Missouri, Columbia). Phys. Rev. 98, 1061-2(1955) May 15.

The luminescence due to the absorption of x rays in air has been studied in the range 600 to 250 mμ. Relatively strong peaks were found at 356, 336, and 314 mμ with lesser peaks at 388, 378, and 373 mμ. This luminescence has been associated with argon present in the atmosphere. (auth)

5182

ELECTRONS EMITTED FROM METALS AFTER THE IRRADIATION BY 1.5 MEV X-RAYS. J. J. Orlin (Univ. of Bergen, Norway). Univ. i Bergen Arbok, Naturvitenskap. Rekke, No. 9, 1-14(1954). (In English)

After irradiation of metals by 1.5-Mev x rays the emission of electrons was found to be due to the after effect, except for for Ag and Cd which also gave the well known conversion electrons due to their isomeric states. No conversion electrons due to isomeric states with half lifes between 20 sec and 15 minutes could be found for the following metals: Mg, Al, Fe, Ni, Cu, Zn, Mo, Pd, Sn, Ta, W, Au, and Pb. (auth)

RADIOACTIVITY

5183 SUI-55-1

Iowa. State Univ., Iowa City.

GAMMA RAYS FROM THE LOW ENERGY PROTON BOMBARDMENT OF BERYLLIUM. R. R. Carlson and E. B. Nelson. [1954?]. 30p.

The gamma radiation produced in the $Be^9(p,\gamma)B^{10}$ reaction at proton energies of approximately 300 kev was investigated with scintillation spectrometers. A three-crystal scintillation spectrometer detected 6.7 ± 0.15, 6.0 ± 0.1, 5.1 ± 0.1, and 4.7 ± 0.15 Mev gamma rays with relative intensities (± 25%) of 0.15, 0.40, 1.00 and 0.45, respectively. A thick target yield of $(1.2 \pm 0.3) \times 10^{-10}$ gammas per proton at 315 kev proton energy was measured for gamma radiation of 5.1 Mev energy. These gamma rays are produced in transitions to the ground state and low lying levels in B^{10} and their relative intensities and yield imply spin 1^- for the level at 6.89 Mev. A limited single crystal spectrometer detected 0.41 ± 0.02, 0.72 ± 0.02, 1.03 ± 0.03, and 1.43 ± 0.03 Mev gamma rays corresponding to transitions between the low lying levels in B^{10}. The angular correlation of the 0.72 and 1.03 Mev gamma rays was found to be consistent with a spin of 1^+ or 2^+ for the first excited state of B^{10}. (auth)

5184

INTERNAL CONVERSION RADIATION OF RADIUM. Mira K. Jurić and Dimitrije M. Stanojević. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 15-18(1955) Mar.

Sensitive photonuclear emulsions were used to investigate the electron radiation Ra^{226}. The value of the K/L+M+N ratio obtained indicates that the transition is an electric quadrupole. (C.W.H.)

5185

PAIR EMISSION FROM P^{32}. Aleksandar B. Milojević and Veljko Z. Wintersteiger. Bull. Inst. Nuclear Sci. "Boris Kidrich" (Belgrade) 5, 19-22(1955) Mar.

The annihilation radiation from P^{32} has been measured by the slow-fast coincidence method, with a resolving time of 5×10^{-8} sec. The result obtained is less than 1.3×10^{-7} positrons per β disintegration, which is in agreement with the theory of internal pair formation by the β particles. (auth)

5186

DECAY OF ^{103}Ru. H. H. Forster and A. Rosen (Univ. of Southern California, Los Angeles). Nuovo cimento (10) 1 972-3(1955) May. (In English)

The β and γ spectra of Ru^{103} have been studied with a double thin lens β-ray spectrometer and a NaI crystal spectrometer. Three β groups were detected with endpoint energies of 128 ± 4, 202 ± 2, and 695 ± 15 kev. Experimental results are compatible with the existence of a fourth group of maximum energy 374 ± 20 kev. Gamma lines of 55, 498, and 610 kev were detected. Photoelectron peaks were found corresponding to γ-ray energies of 297, 323, and 366 kev. An interpretation of the experimental results is presented. (M.P.G.)

5187

ON THE SPONTANEOUS FISSION OF THORIUM. A. V. Podgurskaya, V. I. Kalashnikova, G. A. Stolyarov, E. D. Vorob'ev, and G. N. Flerov. Zhur. Eksptl'. i Teoret. Fiz. 28, 503-5(1955) Apr. (In Russian)

The value 1.4×10^8 yr for the half life for spontaneous fission of Th given by Segré (Phys. Rev. 86, 21, 1952) is considered too low because of inadequate correction for cosmic radiation and the presence of transuranic elements. The authors' experiments suggest that the probability of spontaneous fission is extremely small and that the half life is greater than 10^{20} yr. (G.Y.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

5188

THE PARAMAGNETIC RESONANCE SPECTRA OF SOME RARE-EARTH DOUBLE NITRATES. A. H. Cooke and H. J. Duffus (Univ. of Oxford, England). Proc. Roy. Soc. A229, 407-15(1955) May.

The paramagnetic resonance spectra of praseodymium magnesium nitrate, neodymium magnesium nitrate, and samarium magnesium nitrate have been analyzed using centimeter wavelengths. The magnetic susceptibility and the magnetic contributions to the specific heat are computed for each salt. (auth)

SPECTROSCOPY

5189 NP-5657

Brown Univ., Providence. Metals Research Lab.
and Maryland. Univ., College Park.
VIBRATION SPECTRUM OF GRAPHITE AND BORON NITRIDE. 1. THE TWO DIMENSIONAL SPECTRUM. Gordon F. Newell. May 15, 1955. 47p. Contract Nonr-562(08).

A detailed analysis of the vibrational modes of graphite and boron nitride, which are sufficiently similar that they can conveniently be considered together, begins with a study of the effects of interactions only between particles in the same layers of the lamellar structure. The secular equation for any lattice vibration problem can be written as a sum of contributions arising from the interactions between various groups of particles. After describing a system of notation which will eventually be used to describe all types of interactions, that part of the secular equation resulting only from nearest neighbor is derived. The frequencies and the spectral densities of all frequency branches are obtained for a system with only these forces. Due to the existence of some low frequency branches, it is necessary to also consider second nearest neighbor forces, even though they may be relatively much weaker, in order to obtain a complete realistic description. The frequencies of all modes of the system with both types of forces are then analysed. Part of the spectrum can still be found in closed form; other parts can be found only approximately. This analysis gives a fairly complete description of a "course grain" frequency distribution which can, in principle, be used to describe the thermodynamic behavior of the system at all but the lowest temperatures where the interactions between layers become significant. The principle limitation on its usefulness is at present due to the sizeable number of as yet unknown parameters necessary to describe the system numerically. (auth)

5190

RELATIVE INTENSITIES OF THE X-RAY K LINES OF HEAVIER ELEMENTS. Olof Beckman. Arkiv Fysik 9, No. 32, 495-529(1955). (In English)

X-ray K spectra have been obtained for the elements Ta through Bi, Th, and U. The intensity ratios between K lines and the $K\alpha_1$ line were calculated and are in general agreement with theoretically determined values. A 2.5 m focusing curved crystal x-ray spectrometer was used and is described. The x radiation was registered by a scintillation counter and a single channel discriminator. A stabilized 800 kev van de Graaff generator was used as the high voltage source. (M.P.G.)

5191

COMPUTED TRANSITION PROBABILITIES FOR X-RAY CONTINUA OF POTASSIUM. Margaret N. Lewis, Louis C. Green, Marjorie M. Mulder, and Paul C. Milner (Haverford Coll., Penna.) and Eleanor K. Kolchin (Columbia Univ., New York). Phys. Rev. 98, 1020-8(1955) May 15.

The rate of change of the oscillator strength at the K-edge of ionized potassium has been computed in a number of ways and a few computations have been made on the L-edge. The work has been carried through by using both hydrogenic and Hartree wave functions at the level of the single-electron approximation and Hartree and Hartree-Fock wave functions when the single-electron approximation was not used. Calcium wave functions both with and without exchange have also been employed. The moment, momentum, and acceleration matrix elements have been computed. The momentum matrix element gives values most closely in agreement with experiment and is most stable with respect to changes in the wave functions. It is followed by the acceleration and the moment in that order. The single electron approximation gives good results. If the single-electron approximation is not used, it is essential that exchange effects be included by employing the determinant form of the wave functions, and the Hartree-Fock one-electron wave functions then give considerably better results than the ordinary Hartree functions. It also proves to be possible to substitute the wave functions of the unexcited ion of next higher atomic number, calcium, for the wave functions of potassium excited in an x-ray level without noticeable deterioration in the results. (auth)

5192

ELECTRON BROADENING AND SHIFT OF SPECTRAL LINES OF HELIUM. Bennett Kivel (Yale Univ., New Haven, Conn. and Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 98, 1055-60(1955) May 15.

The quantum mechanical treatment of electron broadening as used by Kivel, Bloom, and Margenau is extended to include line shifts and is applied to the He I spectrum. The 3d → 2p line is anomalous, since it has a small Stark shift and consequently a small Holtsmark broadening. For it the electron effects dominate. Comparison of this line's width and shape with others in the He I spectrum provides a simple experimental check on the theory. (auth)

THEORETICAL PHYSICS

5193 RD(R)-8134

United Kingdom Atomic Energy Authority. Industrial
Group H. Q., Risley, Lancs, England.
A GENERAL FORMULA FOR UPPER BOUNDS FOR THE CRITICAL SIZE OF A REFLECTED MONOENERGETIC SYSTEM. R. T. Ackroyd. Dec. 6, 1954. 7p. (WHC(C)/P-35)

A variational formula is given for determining upper bounds for the critical size of a reflected monoenergetic system. The variational principle given can be used to obtain the one-group diffusion equations for a reflected body, if necessary, but the object of the note is to discuss the direct methods of the calculus of variations for calculating critical size. (auth)

5194 RD(R)-8135

United Kingdom Atomic Energy Authority. Industrial
Group H. Q., Risley, Lancs, England.
ON THE CONJECTURE THAT STEINER SYMMETRIZATION REDUCES CRITICAL MASS. R. T. Ackroyd and Jean M. Ball. Apr. 26, 1955. 5p. (WHC(C)/(-36)

Steiner symmetrization is shown to be a useful method for determining a lower bound for the critical mass of a reflected fissible body according to one-group diffusion theory. (auth)

5195 AEC-tr-2150

ON THE MULTIPLE PRODUCTION OF PARTICLES DURING COLLISIONS OF FAST PARTICLES. L. D. Landau. Translated by M. Hamermesh from Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 17, 51-64(1953). 27p.

A method is suggested for determining the total number of particles produced in the collision of fast particles without a detailed examination of the motion of the system. The method is based on the assumption that the motion of the system for a short time after the collision can be considered in the same manner as the motion of an ideal liquid. It is shown that the total number of particles in a star is equal to a constant multiplied by the total entropy of the system. The special cases of collisions of 2 protons and of 2 identical nuclei are considered. Expressions are derived for the angular and energy distributions of the produced particles. (M.P.G.)

5196 TT-543

SYMMETRY PROPERTIES IN THE THEORY OF ELEMENTARY PARTICLES AND OF NUCLEAR PROCESSES. (Svoistva Simmetrii v Teorii Elementarnykh Chastits i Iadernykh Protsessov). I. S. Shapiro. Translated by G. Belkov from Uspekhi Fiz. Nauk 53, 7-68(1954). 94p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-6003.

5197 TT-544

ON NON-LOCAL FIELDS AND THE COMPLEX NATURE OF "ELEMENTARY" PARTICLES (DYNAMICALLY DEFORMABLE FORM-FACTOR). (O Nelokal'nykh Paliakh I Slozhoni Prigode "Elementarnykh" Chastits (Dinamicheski Deformiruemyi Formfaktor)). M. A. Markov. Translated by G. Belkov from Uspekhi Fiz. Nauk 51, 317-41(1953). 40p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-1658.

5198

DIPOLE VELOCITY AND DIPOLE LENGTH MATRIX ELEMENTS IN π ELECTRON SYSTEMS AND CONFIGURATION INTERACTION. Max Wolfsberg (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 23, 793-5(1955) May.

Equations relating dipole velocity and dipole length matrix elements have been tested for π electron systems treated by a molecular orbital method. Considerable improvement in the validity of the equations is noted when configuration interaction is included in the calculations. (auth)

5199

MULTIPOLE FIELDS. M. E. Rose (Oak Ridge National Lab., Tenn.). New York, John Wiley and Sons, Inc., 1955. 99p.

Group theoretic methods have been utilized in a description of the electromagnetic field. The angular-momentum and parity properties (transformation properties) of multipole fields are considered primarily. The first three chapters are devoted to the general development of the theory of multipole fields, and the last three chapters are concerned mainly with applications. (M.P.G.)

5200

QUANTUM THEORY OF THE RADIATING ELECTRON. IV. A. A. Sokolov and I. M. Ternov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Phys. 28, 431-6(1955) Apr. (In Russian)

An expression is derived for the quantum correction to the trajectory of a relativistic electron in an axial-symmetric magnetic field. (tr-auth)

URANIUM AND URANIUM COMPOUNDS

5201 TT-533

TEMPERATURE DISTRIBUTION AND HEAT STRESSES DUE TO THERMAL NEUTRONS IN A CYLINDRICAL URANIUM ROD. (Durch Thermische Neutronen Verursachte Temperaturverteilung und Waermespannungen in Einem Zylindrischen Uranstab). V. O. Eriksen and W. Hälg. Translated by D. A. Sinclair from Arbeitsgemeinschaft Kernreaktor, Schweiz, Internal Report No. 2, 1954. 15p.

5202 TT-535

DEFORMATION OF A URANIUM ROD ON CONTINUOUS HEATING UP TO 700°C. (Deformation Eines Uranstabes Bei Dauererwaermung Bis 700°C). R. Risch. Translated by D. A. Sinclair from Arbeitsgemeinschaft Kernreaktor, Schweiz, Internal Report No. 7, Apr. 1954. 8p.